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ANTARCTICA

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SCIENCE, AND TRANSPORTATION
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ANTARCTICA

MONDAY, SEPTEMBER 24, 1984

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:41 a.m., in room SR-253, Senate Russell Office Building, Hon. Slade Gorton (chairman of the subcommittee) presiding.

Staff members assigned to this hearing: Cheryl Coodley, professional staff member and James Drewry, minority staff counsel.

OPENING STATEMENT BY SENATOR GORTON

Senator GORTON. Good morning.

Antarctica is the coldest, windiest, and most isolated continent in the world. Ninety-eight percent of the continent is covered with ice, but it is unique for other reasons as well, reasons that make Antarctica justifiably a focus of increasing world attention.

Since the International Geophysical Year, 1957–58, in which science became the primary focus of activity in Antarctica, Antarctica has become kind of a laboratory, an observation post, if you will, for detecting important changes in the world's environment. Scientific research carried out in Antarctica covers the disciplines of glaciology, biological and medical research, Earth sciences, atmospheric sciences, and ocean sciences.

Despite its frigid weather, Antarctica is a rich source of living resources, including krill, the dominant food for many species of whales, seals, and sea birds.

In 1982, the Convention on the Conservation of Antarctic Marine Living Resources, or CCAMLR, entered into force as a means of ensuring rational resource utilization in the Antarctic. The Congress currently is considering legislation to implement CCAMLR for the United States.

Antarctica also offers the possibility of significant nonliving resources. The challenge is developing those resources in a manner consistent with Antarctica's fragile ecosystem. Negotiations are currently under way to establish an international regime for the development of mineral resources similar to the framework for management of living resources.

The recent history of Antarctica, happily, is one of unique international cooperation. Antarctica is an arms-free zone in which all of the nations represented make their facilities available for inspection by other nations. But there are challenges and questions ahead for Antarctica, and these are the subject of today's hearing.

We will hear from distinguished experts on first, the treaty system and recent international developments about future management of Antarctica; second, the status and importance of the Convention on Conservation of Antarctic Living Marine Resources; third, the status and importance of current negotiations for an Antarctic minerals treaty; and, fourth, the ongoing and planned scientific research in Antarctica.

Our first witness is Mr. Tucker Scully of the State Department. Mr. Scully, welcome. Please come forward and we will hear from you.

STATEMENT OF R. TUCKER SCULLY, DIRECTOR, OCEANS AND POLAR AFFAIRS, DEPARTMENT OF STATE

Mr. Scully. Thank you, Mr. Chairman.

Let me start by saying a word or two about my connection with Antarctica. I am the Director of the Office of Oceans and Polar Affairs in the Department of State, an office which is found in what is known as the OES Bureau, the Bureau of Oceans and International Environmental and Scientific Affairs.

That Bureau within the Department has responsibility for Antarctic matters and, in turn, the Department itself chairs the Antarctic Policy Group, which is the interagency mechanism for the development and coordination of U.S. Antarctic policy.

As the Director of the Office of Oceans and Polar Affairs I have been involved in most international matters dealing with Antarctica over the past number of years. It has been a great pleasure and quite an interesting experience to be engaged in this field.

As the leadoff witness I would like to try to provide an overview of the Antarctic Treaty system, the nature of the system itself and some of the issues which face the Antarctic Treaty system at this particular point in time.

First of all, I might make several brief comments on U.S. Antarctic policy. I would note that I have a statement for the record which I will try to summarize.

Senator Gorton. The whole statement will be included in the record.

Mr. Scully. Thank you.

U.S. Antarctic policy since or even prior to the conclusion of the Antarctic Treaty in 1959 has displayed a high degree of continuity. The United States has defined its interests in Antarctica on a number of occasions since the late 1950's. These interests have included political and security interests, including specifically the reservation of Antarctica for peaceful purposes only, preventing Antarctica from becoming the scene or object of international conflict or discord.

There are also environmental and scientific interests which have been articulated consistently since the definition of U.S. policy toward Antarctica. We have a major interest in ensuring the protection of the Antarctic environment and the maintenance of Antarctica as a laboratory for important scientific research.

Finally, we have also defined our interests in resources in Antarctica. We have indicated an interest in increased knowledge of the resource potential of Antarctica, ensuring that resource activities, should they take place, take place in a fashion that is consistent with the protection of the Antarctic environment and ensuring that if resource activities do in fact become possible that the United States will have a reasonable shot at participating in those activities on reasonable terms and conditions.

Most recently, President Reagan in early 1982 reaffirmed U.S. policy of maintaining an active and influential presence in Antarctica and reaffirmed full range of U.S. Antarctic interests. The President underlined the fact that U.S. maintenance of an active influential presence in Antarctica is designed to serve this full slate of U.S. interests in Antarctica.

No catalog or listing of U.S. interests would be complete without an emphasis upon the Antarctic Treaty itself, the Antarctic Treaty. The treaty, which entered into force in 1959—excuse me, which entered into force in 1961, having been concluded in 1959—is the vehicle, the international vehicle, through which the United States pursues its Antarctic interests.

I would cite several specific elements of the treaty as being particular significant. First, of course, is the fact that it is a very important arms control and disarmament agreement. The treaty reserves Antarctica exclusively for peaceful purposes, prohibits military activities of all kinds—including the testing of weapons—and essentially renders Antarctica a nuclear-free zone in which the testing of nuclear weapons and the disposal of radioactive waste are prohibited.

A second major feature of the Antarctic Treaty is that it establishes a basis for cooperation, international cooperation, in scientific research in the area, guaranteeing the freedom of research in return for the commitment among the parties to the treaty to freely share the results of the observations—of the research—following the conduct of the activity, and to share in advance among the countries undertaking the activity plans for projected activities to allow for coordination and in fact for mutual cross-fertilization of research activities.

The treaty, to achieve these objectives, establishes an imaginative formulation which permits those seven countries which claim territorial sovereignty in Antarctica, and those countries, including the United States, which do not assert claims or recognize the claims of others, to cooperate in a way which is without prejudice to those legal positions but which allows the countries to apply common obligations to the activities covered by the treaty.

The treaty established a mechanism for its future evolution in its provision for regular meetings—consultative meetings—of representative of the 12 original signatories, as well as representatives of countries that later accede to the treaty during such time as those countries display their interest in Antarctica by the conduct of substantial scientific research there. There are now 16 consultative parties.

The consultative mechanism, foreseen in the treaty is designed to ensure that the obligations that are included in the treaty itself are given further substance and that new circumstances and new issues can be dealt with as and when they arise.

At these regular consultative meetings there have been a number of agreed recommendations adopted by the consultative parties. Well over 100 recommendations have been adopted dealing with a whole variety of subjects, many of which relate to scientific research and logistics activities necessary to support scientific research, but many of which also deal with new issues, including resource issues.

The parties have developed a series of agreed measures to preserve Antarctic flora and fauna, measures which were implemented by the United States in the Antarctic Conservation Act of 1978.

The parties have dealt with Antarctic sealing and took an initiative in one of the consultative meetings which led to the Convention on the Conservation of Antarctic Seals in 1972. Another initiative led to the Convention on the Conservation of Antarctic Marine Living Resources [CCAMLR], which you, Mr. Chairman, referred to in your introductory remarks. A bit more of that later.

Finally, pursuant to a 1981 recommendation of the consultative parties, there are ongoing discussions aimed at developing an international system for making decisions about possible mineral resource activities in Antarctica—a regime for mineral resources, as it is called.

As to the operation of the Antarctic Treaty system itself, I would simply say that this system, in our view, has successfully developed as a dynamic and effective means for dealing with new issues and dealing with new circumstances and resolving issues when they require solution.

The system has been one which has ensured that the principles of the treaty which were relevant in 1959 have maintained their relevance today and in fact have ensured that those principles are implemented on an international basis in a fashion which is as effective today as it was then.

A brief word or two on CCAMLR. There are others who will discuss in detail the nature of the convention and if my testimony, to one is a summary of the provisions of the convention in some detail. The conclusion of CCAMLR represents the fruition of a trend which had emerged within the consultative mechanism of identifying and providing recommendations as to how to deal with resource issues.

CCAMLR represents the first major example of dealing with resource issues within the Antarctic treaty consultative mechanism, the first occasion in which the concern and commitment to the protection of the environment has reflected in the treaty system has been applied to circumstances in which there were specific economic interests at hand, in which commercial harvesting, at least on an experimental basis, had been initiated.

CCAMLR established machinery for giving effect to its principles and purposes, a commission, scientific committee and secretariat. There have been now three annual meetings held under CCAMLR, the most recent of which concluded on September 14 of this year in Hobart, Tasmania, which is the headquarters site of the Commission.

There are now 16 members of the Commission, 14 consultative parties, the German Democratic Republic, which is not a consultative party, and the European Economic Community. All participated in the msot recent meeting of CCAMLR along with observers from Brazil and Sweden, and from six international organizations, including the FAO and the International Union for the Conservation on Nature and Natural Resources.

This third annual meeting of CCAMLR represented the transition, if you will, from the startup phase of the convention to the implementation phase of the Convention. The first two annual meetings had been primarily directed toward the establishment of the machinery and undertaking the financial and administrative actions necessary to give effect to and to ensure that the machinery could operate.

At this year's annual meeting, it was clear the machinery was in place and the substantive work of CCAMLR began in earnest. The emphasis at this year's CCAMLR meeting was upon fish populations in the Convention area, particularly fish populations in the area around the island of South Georgia in the Atlantic sector.

As a result of preliminary assessments undertaken by the scientific committee, there were a number of steps taken to deal with fishing activities. Specifically, there was an agreement in the Commission there should be no further directed fisheries for the species *Notothenia rossii* in the statistical area which includes South Georgia, that bycatch of that species should be avoided. Other measures taken included a minimum net mesh size throughout the Convention area, and a prohibition of all fishing within 12 nautical miles of the island of South Georgia.

With regard to other matters, the emphasis within the Commission and Scientific Committee continue to be on the data reporting and collection system to establish a basis for more long-term and more detailed assessment of the populations of all the resources. This is an area, one in which I think the United States has taken the lead.

Our general view is that the progress at this meeting was quite good. It should be stressed that the implementation of CCAMLR is an activity that one never can say is complete. It will require continuing efforts, but we are rather encouraged by the start that has been made with the substantive work of the Convention.

Turning to mineral resource issues, the question of Antarctic mineral resources arose at approximately the same time in the treaty mechanism as the question of living resources. Given the fact that experimental fishing at least was in fact taking place at the time, the parties agreed that priority should be accorded to the question of living resources. With the conclusion of CCAMLR, the parties have sought to work more directly and specifically with the objective of establishing an arrangement, or regime, as it is called, for dealing with possible mineral resource activities in Antarctica.

The nature of the regime that is anticipated essentially a system for determining the acceptability of possible mineral resource activities in Antarctica and, if such activities were determined to be acceptable, for providing the means of governing them to ensure that they took place in a fashion that did not cause risk, did not bring risk to the Antarctic environment.

The United States has again been a leader in seeking the conclusion of a reasonable regime for Antarctic mineral resources. Since 1981, at which time the consultative parties agreed that a regime should be concluded, there have been a series of special consultative meetings or informal special consultative meetings to seek to elaborate a draft regime.

The most recent of the meetings took place in Tokyo in May of this year and the next session, the next round of discussions on mineral resources, will take place in the early part of 1985 in Brazil.

The effort, if you will, is to develop a regime which is comparable to that which has already been done with regard to living resources. It is not known at this stage whether in fact there are mineral resources in Antarctica, deposits of minerals in Antarctica, that would be feasible to develop from an economic point of view.

It is, however, the intention of the consultative parties, one which I think is laudable, that there be a system in place for making decisions about such possible mineral resource activities before any major pressure develops for the exploitation of those minerals. At this stage of the game, we do not know whether such pressure will develop, but it has been our view that for those environmental and political reasons it is important to have an effective system in place prior to the possible development of interest in the resources.

We believe that the regime should involve no presumption one way or the other as to whether mineral resource activities should take place. It should provide for the machinery, the obligations, the means for making decisions, for applying tough environmental criteria to possible activities, if and when such activities are proposed.

This is an area in which there may be further discussion during the course of this morning's testimony, and I would be glad to answer questions on this point.

Finally, in looking at the question of the operation of the Antarctic treaty system, one of the areas which has drawn most recent attention is the question of Antarctica in the United Nations. As a result of an initiative taken by the Government of Malaysia, an item on Antarctica was included on the agenda of last year's General Assembly, and after informal discussions a consensus resolution on Antarctica was developed by the General Assembly last fall.

This resolution essentially called for a study of Antarctica by the U.N. Secretary General, a study which is to be, in the words of the resolution, "comprehensive, factual, and objective." The United States and the other Antarctic Treaty consultative parties were able to participate in that consensus on the resolution because it was neutrally worded and did call for a study which we believe will demonstrate the effective operation and the benefits of the Antarctic Treaty system to the U.N. system as a whole.

The U.N. Secretary General is to report this fall to the General Assembly on this item.

Our concern with the initiative as it had been presented is that there is an implication that there is some need for basic modification in or even replacement of the Antarctic Treaty system. We reject this premise and in general terms, our attitude toward U.N. consideration of Antarctica rests on the "if it ain't broke, don't fix it" maxim.

The United States has provided a great deal of information to the Secretary General in response to his request in relation to the study, and we are looking forward to seeing what the Secretary will produce.

With respect to potential consideration by the General Assembly of Antarctica, it is our view that the Antarctic Treaty represents one of the more successful examples of the practical implementation of the principles and purposes of the U.N. Charter. The treaty is one which we think demonstrates, particularly in this day and age, how countries with differing political and social systems can cooperate together for common objectives.

The operation of the treaty, with the way the treaty system has evolved, has made it as relevant and valid today as it was in 1959.

Insofar as the potential relationship between the United Nations and the Antarctic Treaty system goes, it is our view that that relationship should be of a functional rather than a political character. The kinds of relationships that have evolved between the Antarctic system and U.N. specialized agencies should continue and should continue to be built upon.

As one example, during the recent CCAMLR meeting the representative from FAO, played an active and important role. It is this kind of collaborative effort between the Antarctic system and the U.N. system on a functional basis which we think is the best direction for future cooperation to take.

Mr. Chairman, there are a number of other items mentioned in your invitation which I will not touch upon here directly, particularly relating to scientific research in Antarctica, with which we deal quite frequently. As a final comment relating to these items, I would say that, in spite of the growing interest in resource and other activities in Antarctica, it is my view at least that scientific research is and will remain as far in the future as anyone can foresee the most important human activity in Antarctica and I think we should continue to look at the scene from that perspective.

Thank you.

[The statement follows:]

STATEMENT OF R. TUCKER SCULLY, DIRECTOR, OFFICE OF OCEAN AND POLAR AFFAIRS, BUREAU OF OCEANS AND INTERNATIONAL ENVIRONMENTAL AND SCIENTIFIC AFFAIRS, DEPARTMENT OF STATE

Mr. Chairman: I am R. Tucker Scully, Director of the Office of Ocean and Polar Affairs, Bureau of Oceans and International Environmental and Scientific Affairs (OES), Department of State. It is a pleasure for me to appear before the subcommittee to discuss Antarctic issues.

The Department of State chairs the Interagency Antarctic Policy Group which is responsible for United States Antarctic policy. The Assistant Secretary of State for OES, James L. Malone, is the Chairman of the Policy Group and my office, within OES, acts as the equivalent of an Antarctic desk. As Director of that office, I have been involved in most of the international negotiations relating to Antarctica over the past eight years. Therefore, I would like to lead off with an overview of the Antarctic Treaty System and the current issues which engage that System.

UNITED STATES ANTARCTIC POLICY

The United States Antarctic policy rests on an articulation of U.S. interests in Antarctica, which has displayed a high degree of continuity over the past three decades. These interests include three interrelated categories: policy and security interests; environmental and scientific interests and resource interests. They may be summarized as follows:

POLITICAL AND SECURITY INTERESTS

Reservation of Antarctica for activities that serve peaceful purposes only;

Prevention of Antarctica from becoming the scene or object of international discord;

Continuation of the peaceful and cooperative relationships regarding Antarctica among those states active there;

Continuation of the demilitarized and nuclear-free status of Antarctica, including the ban on testing of weapons and provision of full on-site inspection rights guaranteed by the Antarctic Treaty;

Preservation of U.S. access to all areas of Antarctica and surrounding marine areas for peaceful purposes; and conversely, prevention of such access being denied the U.S. or its nationals on the basis of territorial claims or otherwise; and

Preservation of any basis for a U.S. claim to territorial sovereignty in Antarctica which existed prior to the entry into force of the Antarctic Treaty.

ENVIRONMENTAL AND SCIENTIFIC INTERESTS

Protection and mainenance of the Antarctic environment, including the ecological systems of the continent and southern ocean;

Increased understanding of the role natural processes in Antarctica play in phenomena of global significance, including biological, geological, geophysical, meteorological and oceanographic processes;

Increased scientific understanding of global processes, the nature of which can be better understood as a result of evidence available in Antarctica, as for example, worldwide dispersal pattern of man-introduced pollutants and upper atmosphere physics;

Increased baseline data and information on marine and terrestrial areas within the Antarctic Treaty area; and

Maintenance of the freedom of scientific research in Antarctica and the cooperative of data gathered in accordance with the Antarctic Treaty.

RESOURCE INTERESTS

Increased knowledge of the populations of living resources in Antarctica and the ecological systems of which they are part;

Conservation of the living resources of Antarctica and of the southern ocean, including all species found there, ensuring the health of individual populations and the ecological systems of which they are a part;

Participation in the development and implementation of management mechanisms for conserving the living resources of Antarctica;

Provision of access for United States nationals to harvest living resources, in accordance with agreed conservation objectives and measures, should such harvesting interest develop;

Increase knowledge of the non-living resource potential of Antarctica and of the environment in which such resources may be located;

Ensuring that any mineral resource activities are acceptable from an environmental perspective;

Facilitation of an increase in the global supply of such resources through:

(a) Definition of rights to Antarctic mineral resources; and

(b) Ensuring reasonable conditions of investment consistent with U.S. interests; and

Provision of non-discriminatory access for the U.S. to all areas of Antarctica in which mineral resource activities may be determined acceptabie.

In pursuit of these interests, it is United States policy to maintain an active and influential presence in Antarctica. President Reagan affirmed this objective in early 1982. The press statement describing this decision stated in part:

"The United States has significant political, security, economic, environmental, and scientific interests in Antarctica. These are reflected in the Antarctic Treaty of 1959. The system established by that treaty has permitted its parties, who maintain different positions concerning claims to territorial sovereignty in Antarctica, to work together to further scientific research and to ensure that Antarctica does not become the scene or object of international discord . . .

"President Reagan has affirmed the United States commitment to a leadership role in Antarctica, both in the conduct of scientific research on and around the continent and in the system of international cooperation established pursuant to the Antarctic Treaty."

As is indicated in the press statement the vehicle through which the United States pursues its Antarctic interests is the Antarctic Treaty of 1959, and the system of supplementary measures and agreements which has evolved under that treaty. The United States, therefore, has a major interest in the maintenance and effective functioning of the Antarctic Treaty System.

THE ANTARCTIC TREATY SYSTEM

The Antarctic Treaty of 1959 (which entered into force in 1961) resulted from an initiative by the United States. The initiative sought to place on a permanent basis the system of peaceful international cooperation in scientific research which had evolved on an ad hoc basis during the International Geophysical Year of 1957–58.

The Antarctic Treaty guarantees freedom of scientific research in Antarctica and establishes the basis for scientific research in Antarctica. Plans for scientific research are to be shared in advance and the results of scientific investigations are to be shared and made freely available.

Equally important, the Antarctic Treaty is an important arms control agreement. The treaty reserves Antarctica exclusively for peaceful purposes, banning all military activities, including the testing of weapons, and prohibiting nuclear explosions and the disposal of radioactive waste. In effect, the Treaty establishes Antarctica as a zone of peace. In addition, the Treaty provides an absolute right of on-site inspection of all stations and installations in Antarctica to promote the objectives of the Treaty and ensure compliance with its provisions.

To achieve these purposes, the Antarctic Treaty had to deal with basic legal and political differences over the status of Antarctica. Seven of the original signatories—Argentina, Australia, Chile, France, New Zealand, Norway and the United Kingdom—assert claims to territorial sovereignty in Antarctica. The other five original signatories—the United States, the Soviet Union, Japan, Belgium and South Africa—neither assert nor recognize such claims. Through an imaginative juridical formulation which permits the parties to agree to disagree over the sovereignty issue, the Treaty establishes a basis for international cooperation in Antarctica. In effect, for those activities, with which it deals, the Treaty provides means for its parties—starting from different legal assumptions—to apply common obligations to activities in Antarctica.

As is implied above, the Antarctic Treaty did not deal with all activities in Antarctica. In substantive provisions, including its imaginative juridical provisions, apply to activities relating to scientific reasearch and the reservation of Antarctica exclusively for peaceful purposes. The Treaty, for example, does not include substantive provisions relating to resource activities.

At the same time, the Treaty provides a mechanism for dealing with new activities and new circumstances. This mechanism, which is contained in Article IX of the Treaty, provides that the twelve original contracting parties meet within two months of entry into force of the Treaty and at suitable intervals, thereafter, for the purpose of exchanging information, consulting together on matters of common interest pertaining to Antarctica and recommending to their governments measures in furtherance of the principles and objectives of the Treaty.

The Treaty, also, provides that the consultative meetings, as they are now called, are open not only to full participation by representatives of the twelve original contracting parties but also to representatives of any acceding party during such time as that party demonstrates its interest in Antarctica by the conduct of substantial scientific research there. There are now sixteen parties (Consultative Parties) which participate in these meetings—Poland, Federal Republic of Germany, Brazil and India have joined the twelve original Consultative Parties. In addition, beginning last year, repreentatives of all other parties to the Antarctic Treaty also participate in consultative meetings as observers. There are also sixteen non-Consultative Parties (Bulgaria, China, Czechoslavakia, Cuba, Denmark, Finland, German Democratic Republic, Hungary, Italy, Netherlands, Papua New Guinea, Peru, Romania, Spain, Sweden and Uruguay).

There have been twelve consultative meetings since the Antarctic Treaty entered into force, at approximately two year intervals—with the next, scheduled for next year in Brussels. As a result of the first twelve consultative meetings, well over one hundred agreed Recommendations have been adopted and implemented by the Consultative Parties. These recommendations provide a wide range measure to give effect to the substantive provisions of the Treaty. Equally important, these Recommendations have served to delineate and respond to new issues and circumstances which have arisen since 1961, most particularly with respect to possible resource activities.

To cite examples in this area, as a result of the operation of this consultative mechanism, recommendations have been adopted which incorporate a wide range of provisions to protect the Antarctic environment from the harmful impact of human activity. These provisions—the Agreed Measures for the Conservation of Antarctic Fauna and Flora—have been implemented by the U.S. in the Antarctic Conservation Act of 1978. Further consultative meetings have called for the development mechanism to ensure effective conservation of Antarctic seals and Antarctic Marine Living Resources. These initiatives have resulted in the conclusion of Convention on the Conservation of Antarctic Seals in 1972 and the Convention on the Conservation of Antarctica Marine Living Resources in 1980. This latter convention, in particular, represents an innovative and important response to possible resource activities—activities which were not clearly anticipated in 1959.

Finally, the issue of mineral resource activities has been a subject of detailed consideration within the consultative system, as a result, the Consultative Parties are now committed to develop a system for dealing with possible mineral resources activities in Antarctica.

The Antarctic Treaty and the Recommendations, Measures and Agreements developed pursuant to the Treaty, taken together with the consultative mechanism itself, are known as the Antarctic Treaty System. This system has provided a dynamic and effective means of anticipating new issues and circumstances and resolving issues as and when require solution. The system has evolved to meet rapid changes and its operation has ensured that the important principles and purposes articulated in the Antarctic Treaty are as relevent and vital today as they were when the Treaty was concluded.

THE CONVENTION FOR THE CONSERVATION OF ANTARCTIC MARINE LIVING RESOURCES

As noted above, the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) resulted from an initative taken in a Consultative Meeting Recommendation adopted in London in 1977. The Convention itself was concluded at a conference in Canberra in May, 1980. The United States ratified the Convention on February 2. 1982 and the Convention entered into force on April 7, 1982.

The Convention on the Conservation of Antarctic Marine Living Resources was concluded at a diplomatic conference held in Canberra, Australia, in May 1980. Fifteen nations participated in the Canberra conference and later signed the Convention: the fourteen which are now Antarctic Treaty Consultative Parties—Argentina, Australia, Belgium, Chile, France, Federal Republic of Germany, Japan, New Zealand, Norway, Poland, South Africa, the U.S.S.R., the U.K., and the U.S.—along with the German Democratic Republic, which is not a Consultative Party.

The Convention includes a conservation standard which reflects an "ecosystem approach" to the management of Antarctic marine living resources. It provides that rational utilization is incorporated in the concept of conservation, but sets forth a commitment to ensuring the health of target and dependent populations, and of the ecosystem as a whole, including the prevention of irreversible environmental changes.

Consistent with its conservation objectives, the Convention applies to a geographic area designed to approximate the full extent of the Antarctic marine ecosystem. This area, defined by specific coordinates, extends to those waters found south of the Antarctic Convergence, or polar front, which is the transition zone between Antarctic waters to the south and warmer sub-Antarctic waters to the north. It should be noted that the Convention area is considerably larger than that covered by the Antarctic Treaty (which applies to the area south of 60° South Latitude).

The marine area covered by the Convention may offer significant potential for harvesting. At the same time, scientific investigations indicate that the Antarctic marine ecosystem—which is characterized by short, simple food chains and dependency upon a single species, Antarctic krill, may be particularly vulnerable to uncontrolled harvesting. For this reason, we are pleased that the Convention has been concluded prior to the initiation of large-scale harvesting activities. Implementation of the Convention offers an unusual opportunity to elaborate and apply an effective management framework to these resources before they become the object of significant exploitation pressure.

The Convention deals with basic differences of view over the existence and nature of maritime jurisdiction in the Convention area among the Consultative Parties. Seven of those Parties claim territorial sovereignty, and thus maritime jurisdiction in Antarctica, while the U.S. and the remaining Parties neither assert nor recognize such claims. The participants in the negotiations recognized that these basic differences could not be finally resolved in this new Convention. In a manner parallel to the Antarctic Treaty, however, they are able to shape the Convention and their future activities pursuant to it in such a manner that all can cooperate in elaborating an effective management system without prejudice to their juridical positions.

The Convention also provides for the establishment of machinery necessary to carry out its objectives. This includes the Commission for the Conservation of Antarctic Marine Living Resources, headquartered in Hobart, Tasmania; the Scientific Committee for the Conservation of Antarctic Marine Living Resources, designed to provide objective scientific assessments and recommendations to the Commission; and a secretariat to serve both the Commission and Scientific Committee. The Convention provides that the Commission will operate on the basis of a consensus—or no-objection—procedure which has been characteristic of the Antarctic Treaty system. This consensus system, which will apply to all matters of substance, is designed to produce genuine negotiated solutions in the operation of the management system.

The Convention provides a close relationship between the resource management system it seeks to establish and the Antarctic Treaty. The Convention incorporates the basic principles found in the Antarctic Treaty. The Convention also provides for establishment of relationships with other relevant organizations—both intergovernmental and non-governmental—such as the IWC, FAO, SCAR, SCOR, which may contribute to the effective operation of the Convention.

The conclusion of the Convention also represents an important example of the international cooperation among the States active in Antarctica, pursuant to the system established under the Antarctic Treaty of 1959. The Antarctic Treaty has permitted its Parties to work together in the conduct of Scientific research there and to maintain the Antarctic Treaty area as one reserved exclusively for peaceful purposes. The new Convention extends this unique form of international cooperation into the domain of resource management and, as such, represents an important international legal and political agreement.

Since the entry into force of CCAMLR, there have been three annual meetings of the Commission and its Scientific Committee. The first two annual meetings (at the headquarters site in Hobart, Tasmania) were largely engaged with start up functions—establishment of the secretariat, headquarters agreement, rules of procedure, staff regulation and financial matters including budgets and financial regulations. At the same time, the Scientific Committee made substantial progress in delineating its initial program of work.

The third annual meetings of the Commission and the Scientific Committee concluded in Hobart on September 14. These 1984 annual meetings demonstrated the transition from the start-up phase to the implementation stage of CCAMLR has taken place. I would like to make a few summary comments on these meetings, recognizing that Dr. Hofman, who is the U.S. Representative to the CCAMLR Scientific Committee, will elaborate further on this year's meetings.

The Commission for the Conservation of Antarctic Marine Living Resources and its Scientific Committee held their third annual meetings September 3-14, 1984.

The sixteen members of the Commission participated, as well as observers from Brazil and Sweden and six international organizations (FAO, IOC, IWC, IUCN, SCAR, and SCOR). After an initial organizational session of the Commission on the opening day, the bulk of the first week was devoted to the work of the Scientific Committee. Alternating sessions of the Scientific Committee and the Commission took place during the second week. The Standing Committee on Administration and Finance also met during the first week to consider the 1985 budget and related financing/administrative matters.

Acting on the basis of the report of the Scientific Committee, the Commission took a number of steps to deal with harvesting of fish populations in the Convention area (assessment of fish stocks had been a priority for the Scientific Committee.) The Scientific Committee expressed greatest concern for fish stocks around the island of South Georgia, particularly for *notothenia rossii* the only species for which a preliminary assessment could be undertaken. In response, the Commission agreed that parties should refrain from fishing for n. rossii in the South Georgia area and to avoid any by-catch of the species. (The action was not a formal conservation measure which could become effective only in early 1985, but a request for the upcoming 1984-85 season.) In addition, the Commission adopted conservation measures providing that there be no fishing within twelve nautical miles of South Georgia and instituting minimum mesh size regulations throughout the Convention area. (The former is to be applied on an interim basis for the 84/85 season prior to becoming effective in early 1985, the latter will apply as of the 1985/86 season.)

There was also discussion of the need for minimum fish size restrictions to supplement the mesh regulations. The Commission did not reach agreement on this point, largely because of lack of agreed Scientific Committee recommendations on the appropriate limits for such species and because of differences in how to handle bycatch of undersized fish. The report of the Commission calls upon parties to use regulations already applicable to the Soviet fleet as guidelines pending resolution of this item at next year's meetings.

The Commission also emphasized the need to complete specific data collection and reporting standards and endorsed the intersessional work on fish stock assessment, krill assessment and ecosystem monitoring called for the Economic Committee. In response to a paper submitted by the U.S. on avoidance of incidental mortality of Antarctic marine living resources, the Commission recommended a series of preliminary steps to collect information on any problem relating to lost or discarded fishing gear or other marine debris in the convention area and to avoid any such problems in the future. The item will be included on the agenda of next year's meeting.

At the eleventh Antarctic Treaty Consultative Meeting in Buenos Aires, the Consultative Parties agreed that a regime for Antarctic mineral resources should be "as a matter of urgency". The term regime is understood as an international system for making decisions about possible mineral resource activities in Antarctica. The recommendation adopted in Buenos Aires provided that the objective of the regime is to provide a means for:

(a) assessing the possible impact upon the Antarctic environment of Antarctic mineral resource activities;

(b) determining whether such activities are acceptable;

(c) governing the environmental, technological, politicals, legal and economic aspects of such activities as may be found to be acceptable;

(d) establishing rules for the protection of the Antarctic environment;

(e) ensuring that any Antarctic mineral resource activities undertaken are in strict conformity with such rules.

It is not known at this stage whether there are deposits of mineral resources in Antarctic whose development would be economically feasible. The commitment of the Consultative Parties to negotiate a regime rests on the belief for making informal decisions about possible mineral resource activities before any specific interest share a commitment to ensure that no mineral resource activities take place unless it can be demonstrated that they could be undertaken in an environmentally sound fashion. Agreement to develop such a regime also reflects the determination that interest in Antarctic mineral resource activities, should it develop, does not become the source of international discord or conflict.

In the U.S. view the basic purpose of a minerals regime is the determination of the acceptability of mineral resource activity in Antarctica and to govern any such activities determined to be acceptable. In our view, an acceptable minerals resource regime must be consistent with the U.S. position on the legal and political status of Antarctica and must include:

Provisions for assurance of non-discriminatory access to all areas of Antarctica in which mineral resource activities are determined acceptable;

Provisions of a stable and predictable legal framework for governing mineral resource activities;

Provision of a system for defining rights to Antarctica mineral resources so as to provide the security of tenure necessary to create a stable and reasonable investment climate;

Provision for the establishment of reasonable terms and conditions to govern specific mineral resource activities;

Provision that decisions about possible activities be based upon information sufficient to judge the possible impacts of those activities;

Provision that mineral resource activities not pose unacceptable risks to the Antarctica environment, including large-scale irreversible changes in that environment and that such activities are consistent with the standards of the Convention on the Conservation of Antarctica Marine Living Resources; and

Provision that technology and operational practices exist to ensure safety of mineral resource activities and that this technology and those practices be employed.

Negotiations on elaboration of the regime have been taking place in a special Consultative Meeting on Antarctic Mineral Resources. The first session took place in Wellington, New Zealand in June, 1982. This has been followed by an informal session also in Wellington in January, 1983; a formal session in Bonn in July, 1983; an informal working group session in Washington in January, 1984; and another informal session in Tokyo in May, 1984. The next round of discussions will be hosted by Brazil in February/March, 1984.

As a result of the discussions to date, an informal text has been developed and revised by Ambassador Chris Beeby of New Zealand who serves as chairman of the sessions. The chairman's text provides a focal point around which to structure specific consideration of the elements of the regime. The text is consistent with the U.S. approach in important elements, though it poses a number of difficulties for us.

The negotiations to date have reflected good progress. These are important issues which lie ahead particularly in the distribution of powers and functions among the institutions which would be provided for in the regime and the manner in which decisions would be taken. However, on the basis of progress achieved to date and the business-like fashion in which the negotiations are taking place, we are confident that the task will be successfully concluded.

ANTARCTICA IN THE UNITED NATIONS

As a result of an initiative taken by the Government of Malaysia, an item on Antarctica was included on the agenda of the United Nations General Assembly last fall. Malaysian representatives indicated a desire for U.N. consideration as a means of determining whether the Antarctic Treaty might require modification or replacement.

After informal discussions at last year's Assembly a consensus Resolution was adopted calling for a study of Antarctica by the U.N. Secretary General. The U.S. and the other Antarctica Treaty Consultative Parties were able to participate in that consensus because the resolution was neutrally worded and required that the study of Antarctica be "comprehensive, factual and objective." The U.N. Secretary General is to report on the study at this fall's U.N. General Assembly.

The United Nations, of course, has a legitimate interest in Antarctica. For its part, the United States, in response to the U.N. Secretary General's request to members for information relating to Antarctica, has provided extensive material on scientific activities in Antarctica and the operation of the Antarctic Treaty System.

Our attitude toward U.N. consideration of Antarctica however is one of "If it ain't broke don't fix it."

The Antarctic Treaty represents an outstanding and successful example of the practical realization of the principles and purposes of the U.N. Charter. In a troubled world, it represents a major contribution to international peace and security and an important example of how states with different political, economic and social systems can promote peaceful cooperation. Further, the treaty system is dynamic and open, which has displayed proven capacity to evolve to meet new circumstances and absorb new interests. There are significant working relationships between components of the U.N. system and the Antarctic Treaty System. In fact the Antarctic Treaty specifically foresees such relationship. This type of function cooperation provides for a procedure and mutually beneficial form of cooperation between these systems. Efforts to establish a competing political forum for Antarctica within the U.N. would serve no purpose.

Therefore, the U.S. like the other Antarctic Treaty Consultative Parties, is not prepared to accept the presumption that the Antarctic Treaty requires modification or replacement. It is on the basis of this attitude, combined with a commitment to ensure the open and effective operation of the Antarctic Treaty System, that we approach any further U.N. treatment of the subject.

CONCLUSION

I have not touched directly upon the final two of the items suggested for today's hearing—SCAR and U.S. scientific research activities in Antarctica. There are witnesses present more able than I to address these subjects. I would, however, make one observation on each point. SCAR—the Scientific Committee on Antarctic Research, which is a non-governmental institution, provides necessary scientific advice to the Antarctic Treaty Consultative Parties. As such, SCAR constitutes an invaluable—albeit informal—component of the Antarctic Treaty System. With respect to the last item, I believe it is fair to say that those most familiar with Antarctic matters would agree that scientific research is now and will remain for the imaginable future the most important human activity in Antarctica.

Senator GORTON. Thank you.

I did not announce this at the beginning, but we will hear the testimony of each of the eight witnesses individually, and then ask all of you to come back up for questions which will be directed to all of you.

So, Mr. Scully, you may return to your original seat. Dr. Hofman is next.

And because there are eight of you, I am going to have to state that from this point on your written testimony will be included in the record in full. I would like you to limit your oral testimony to no more than 5 minutes and this will apply to the balance of the witnesses.

Dr. Hofman, you are next.

STATEMENT OF DR. ROBERT J. HOFMAN, SCIENTIFIC PROGRAM DIRECTOR, MARINE MAMMAL COMMISSION

Dr. HOFMAN. Thank you, Mr. Chairman. It is a pleasure to be here.

I am the Scientific Program Director of the Marine Mammal Commission and have been the U.S. representative for the first three meetings of the Scientific Committee on the Conservation of Antarctic Marine Living Resources. My testimony focuses on issues bearing upon the conservation and protection of marine mammals and other biota that occur in the seas surrounding Antarctica.

More than 15 species of marine mammals, several of which are endangered due to past overharvesting, 100 species of fish, 50 species of cephalopods, and 45 species of penguins and other seabirds occur, at least seasonally, in Antarctic waters. Many of these species depend, either directly or indirectly, on Antarctic krill, *Euphausia superba.*

Antarctic krill is one of the dominant herbivores in the Antarctic marine ecosystem and is the principal component in the diets of blue, fin, humpback, sei, and minke whales, Adelie and chinstrap penguins, several species of petrals and other flying birds, and several species of fishes and squids.

Some of these species are eaten in turn by sperm whales, killer whales, leopard seals, and other higher order predators. Thus, if not regulated properly, the developing krill fishery in the Antarctic could have adverse effects on these krill-dependent species and alter the basic structure and dynamics of the Antarctic marine ecosystem, as well as have adverse effects on krill stocks themselves.

If you would like, Mr. Chairman, I can provide a preprint copy of a paper being prepared for the Commission by Dr. John Bengston. This paper provides an updated summary of available information concerning the fauna of the Antarctic marine ecosystem.

Senator GORTON. It will be included in the record by reference.[1]

Dr. HOFMAN. The Antarctic Treaty consultative parties have recognized the potential adverse effects of the developing krill fishery and other fisheries on the Antarctic marine ecosystem and, at the IX Antarctic Treaty consultative meeting held in London in 1977 agreed that a special consultative meeting should be held to elaborate a regime which would provide for the effective conservation of all living resources in the Antarctic marine ecosystem.

This regime, the Convention on the Conservation of Antarctic Marine Living Resources, as Tucker Scully noted earlier, was concluded at a diplomatic conference held in Canberra, Australia, in May 1980. It came into force on April 7, 1982.

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[1] The report is in the Committee files.

The Convention is unique in a number of respects. First, it applies to all living organisms, not just fish and krill, found south of the Antarctic convergence. Second, it was developed and entered into force before stocks of krill, the species of primary concern, had been overexploited and were in dire need of protective measures. Third, it requires that harvesting and related activities in the Convention area be managed from an ecosystem perspective.

The Convention also has a number of potential weaknesses, however, the most significant of which is the requirement in article XII that substantive decisions of the Commission established by that Convention be taken by consensus. This in effect allows any member to block or veto measures which may be necessary or desirable to achieve the Convention objectives. I should note here, however, that this to date has not been a problem.

As Tucker Scully mentioned earlier, there have been three regular meetings of the Commission and the Scientific Committee established by the Convention. The first meetings, held in June 1982, were devoted primarily to administrative matters. The second meetings, held from August 30 to September 8, 1983, were used primarily to identify and initiate discussions of key issues such as data collection and handling, and to agree on a general program for future work.

During the 1983 meetings of the Scientific Committee, it was noted that several fish stocks apparently have been heavily exploited and may be in need of conservation measures. It was agreed, therefore, that fish stock assessment would be included on the agenda for priority consideration during the 1984 meeting. It also was agreed that consideration of programs necessary to assess and monitor the status of krill stocks and species dependent upon krill would be initiated at that meeting.

During the 1984 meetings, which have just been concluded, the Scientific Committee considered available information concerning the status of exploited fish stocks and determined that five stocks in the vicinity of South Georgia and two stocks in the vicinity of Kerguelen had been heavily fished and might require conservation measures.

Available information suggests, for example, that the biomass of *Notothenia rossii* in the vicinity of South Georgia is less than 10 percent of its biomass prior to the beginning of exploitation in the early 1970's.

In response to recommendations from the Scientific Committee, the Commission requested that parties refrain from fishing for *Notothenia rossii* in the South Georgia area, and to avoid any bycatch of that species. This action was in the form of a request rather than a formal conservation measure, since conservation measures could not become binding under the terms of the Convention for 180 days or well into the 1984–85 fishing season.

The Commission did adopt formal conservation measures prohibiting fishing within 12 nautical miles of South Georgia, and instituting minimum mesh-size regulations throughout the Convention area.

Unlike fish stocks, krill stocks in the Antarctic have not been heavily exploited, except perhaps in several very local areas. Available data indicate that krill catches taken primarily by the Soviets reached a peak of 530,000 tons in the 1981-82 fishing season, and declined to about 250,000 tons in the last two fishing seasons. Soviet scientists indicate the decline was caused by processing and marketing problems, not difficulty in finding or catching krill.

Several problems concerning methods for assessing and monitoring krill abundance were noted during the 1984 Scientific Committee meeting. It was proposed and agreed that a workshop would be held before the 1985 meeting to try to resolve some of these problems. It also was agreed that a working group would meet at the National Marine Mammal Laboratory in Seattle during the week of May 6, 1985, to begin formulating a plan for multinational programs to assess and monitor various ecosystem components.

Finally, in response to a U.S. proposal, Commission members agreed to initiate a series of steps to assure that marine mammals, birds, and other nontarget species are not and will not be affected adversely by incidental take during fishing operations or by being caught in lost or discarded fishing gear or other marine debris.

These actions, which are but first steps, indicate that we are making the transition from the start-up to effective implementation of the Convention. I am optimistic that the Convention will be a successful addition to the Antarctic Treaty system.

Mineral resource activities as well as harvesting could have significant adverse effects on the biota and other components of the Antarctic ecosystem. The Antarctic Treaty consultative parties have recognized this possibility as they recognized the possible adverse effects of fishing and related activities, and, at the 11th Antarctic Treaty consultative meeting in July 1981, agreed that a minerals regime should be elaborated, and that the regime should provide means for assessing the possible impact of mineral resource activities, for determining the acceptability of possible activities, and for governing those activities determined to be acceptable.

Negotiation of the regime was initiated at a special Antarctic Treaty consultative meeting held in Wellington, New Zealand, in June 1982, and is continuing. From the negotiations to date, it is clear that environmental protection is an issue of great importance to all of the parties involved.

There is agreement as reflected in recommendation XI-1 from the 11th Antarctic Treaty consultative meeting, for example, that no mineral resource activity should take place in the Antarctic until it is determined that the activity in question will not have unacceptable impacts.

To help meet this objective, the regime should and presumably will provide criteria for judging the acceptability of various activities as well as a decisionmaking body, a commission, for example, and a scientific/technical advisory body.

The success of both the Living Resources Convention and the minerals regime being negotiated will depend to a great extent on the extent of our knowledge of the structure and dynamics of the Antarctic marine ecosystem. This fact, too, was recognized by the Antarctic Treaty consultative parties, who in 1975 requested that SCAR, the Scientific Committee on Antarctic Research, convene a meeting to assess and report on programs for the study and conservation of Antarctic marine living resources. This meeting, held in Woods Hole in 1976, resulted in what is known as the BIOMASS

Program. BIOMASS is the acronym for biological investigations of marine Antarctic systems and stocks. Implementation of the BIOMASS Program has been through two multinational efforts, the first international BIOMASS experiment called FIBEX, and the second international BIOMASS experiment called SIBEX. FIBEX was conducted during the 1981 austral summer, and SIBEX was initiated last season, and will be completed except for data analyses, during the forthcoming field season.

The BIOMASS Program as implemented with FIBEX focused primarily on Kmill stock assessment, and did not cover the complete range of studies necessary to seek understanding of all important aspects of the Antarctic marine ecosystem. Consequently, the Polar Research Board of the National Academy of Sciences was asked by the National Science Foundation, the National Oceanic and Atmospheric Administration, and the Marine Mammal Commission in 1979 to undertake an evaluation of Antarctic marine ecosystem research. The report of this study, published in 1981, reviews U.S. interests in Antarctic marine ecology, describes the types of research that are necessary to satisfy these interests, and among other things, recommends that the United States should have a strong long-term program in Antarctic biological oceanography, that the U.S. program should include coherent programs and special studies as well as individual projects, and that efforts should be undertaken to improve and develop new technology and methods, including the use of satellites to facilitate acquisition of necessary information.

This report and a subsequent report provided by the Polar Research Board in 1983 have been and are being used to structure the U.S. research program in Antarctica. They provide a sound rationale for program development, and I would be happy to obtain and provide copies if you don't already have them.

That concludes my prepared testimony.

Senator Gorton. Thank you, Dr. Hofman.

Mr. Al Fowler of NSF.

Mr. Fowler, your entire statement will be included in the record, and your additional materials will be included in the record by reference and I would appreciate your summarizing to the best of your ability to do so.

STATEMENT OF ALFRED N. FOWLER, ACTING DIRECTOR, DIVISION OF POLAR PROGRAMS, NATIONAL SCIENCE FOUNDATION

Mr. Fowler. Thank you, sir.

I am Al Fowler, the acting and deputy director for polar programs at the National Science Foundation. I do appreciate your interest in Antarctic activities and the opportunity to be here.

As the management and funding agency for U.S. activities in Antarctica, the foundation is involved substantially in Antarctic Treaty affairs and the international discussions regarding marine living resources and minerals. Clearly other experts here today will comment on these matters, and I will limit my remarks to the ongoing and planned Antarctic research.

Since the IGY that you mentioned in your opening comment, science has served as a principal expression of U.S. national interest in Antarctica. The research program together with the essential operation and logistics support provides an active and influential national presence in Antarctica that is designed to serve the range of U.S. interests in the region.

The bulk of U.S. research in Antarctica is conducted by scientists from universities, nonprofit institutions, or Federal agencies whose proposals are selected primarily through the Foundation's peer review process. A few service projects such as mapping are procured from other agencies. We are operating a program of research primarily in the environmental sciences. It is balanced among the disciplines that are appropriate to Antarctica.

These disciplines are, as you also mentioned, and I will repeat, astronomy, upper atmosphere physics, meteorology, glaciology, geology and geophysics, physical and chemical oceanography, biology, particularly marine biology, and medical research.

We also maintain curatorial services for Antarctic data and samples. In a typical year we field upwards of 90 research projects involving more than 300 investigators.

Mr. Chairman, the Antarctic area comprises 10 percent of our Earth's planet, 8 percent of the global oceans. It is a natural and essential laboratory for the study of regional and global processes. Antarctic research supported by the Foundation is vital to an understanding of solar terrestrial interactions, atmospheric and oceanic processes, present and former climates, geological history, and the adaptations of life forms to extreme environment.

Basic research also supports the assessment of Antarctica's potential for renewable and nonrenewable resources. I will touch on just a few highlights of the research.

In the ocean sciences, a series of 66 cruises by a dedicated, ice-strengthened research ship, *Eltanin,* between 1962 and 1979 covered more than 500,000 miles in the southern oceans with research in oceanography, geophysics, and biology. Our current shipboard work extends and builds upon the *Eltanin* achievement using Coast Guard icebreakers, research ships of the academic fleet, and beginning this year, a chartered ice-strengthened research ship, the *Polar Duke.*

This work has defined the physical and chemical oceanography of the southern oceans, and has shown the influence of Antarctic waters on the world ocean. Antarctic bottom water, for example, which is particularly cold and rich in nutrients, has been found to extend into the northern hemisphere, where it upwells to stimulate local BIOMASS production. One of the long-term objectives of Antarctic research is to better understand the processes by which Antarctic bottom water is formed.

In the Earth sciences, geological reconnaissance has shown the central position of Antarctica in the ancient supercontinent called Gondwanaland. Discovery of fossil plants and animals has revealed Antarctica's warm past, and has shown that the Antarctic was once a pathway between Australia and the Americas for the migration of early mammals.

Antarctic research has thus contributed significantly to the present understanding of plate tectonics. We have produced many geologic maps and topographic maps of most of the exposed rock areas of west Antarctica.

In glaciology, we are working to relate the characteristics of the ice sheet to present and former global climates. A major effort has been to determine the thickness of the ice sheet and the topography of the land under the ice. This work has been done over more than half of the continent using airborne radar.

Ice core drilling has yielded cores for analysis of past climate and atmospheric constituents. We have been able to document, for example, the past variations in atmospheric carbon dioxide and even the appearance of pollutants such as lead in the atmosphere. Current work in glaciology emphasizes continued ice core drilling to recover samples of deeper, older ice, and the study of the mechanisms by which the size of the west Antarctic ice sheet responds to changes in climate and sea level.

The meteorology program in Antarctica includes routine collection of standard weather data in this data-sparse region. Regular observations at manned stations are augmented by automatic sensing devices that telemeter their data to users via satellite.

The research emphasis is on understanding atmospheric circulation patterns as they relate to the rest of the Southern Hemisphere. We also monitor the changes in atmospheric constituents, particularly at the South Pole, which is one of the world's farthest removed points from pollution sources.

Studies in the Antarctic of the magnetosphere and the ionosphere have had an enormous impact on these disciplines. The upper atmosphere in the polar and subpolar regions has been called the earth's window to outer space. Many deep space phenomena can be remotely sensed in the polar regions from the ground, from balloons, rockets, and low-altitude satellites. Our research station in Ellsworth Land is devoted to upper atmosphere physics. It features a 42-kilometer-long horizontal antenna used for studies of the magnetosphere by way of very low frequency wave phenomena.

In astronomy, telescopic observations from the South Pole have confirmed internal characteristics of the Sun that previously had been only predicted by mathematical models. The South Pole is a superb location for these studies, because the sun circles above the horizon for weeks, and the cold, clean, dry atmosphere enables uninterrupted excellent viewing for days at a time.

The biology program has emphasized marine biology, with particular attention on the phytoplankton and zooplankton that form the basis for the short but prolific food chain.

The U.S. research effort emphasizes understanding the ecosystem and the behavioral and reproductive biology of most of the principal species. On land, our biology projects have identified most of the living components in this sparse environment. Unusual forms include lichens living within the surface layer of porous rock, an example of the adaptation of life to one of our planet's extreme environments.

I would like to turn now to research plans for the future. New directions result naturally from the Foundation's usual procedure of receiving and evaluating unsolicited research proposals generated by the research community. We also support studies specifically aimed at analyzing and establishing future research priorities.

For example, the National Academy of Sciences completed a study in 1983 entitled "Research Emphases for the U.S. Antarctic

Program." This report identifies major questions of outstanding importance in Antarctic research, recommends priorities, and suggests specific projects. A copy of this report is appended to the written testimony.

Mr. Chairman, my testimony also contains additional, more detailed information regarding the science program in Antarctica. It also has a brief description of the operations and logistics used to support the research.

There is also attached a review prepared in 1983 by the Office of Management and Budget for the Committee on Appropriations regarding the assignment to the National Science Foundation of management and funding responsibilities for Antarctica.

I appreciate the fact that you indicated that that would be included in the record,[1] and this concludes my presentation.

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[1] The submissions were not reproductible and are in the Committee files.

STATEMENT OF A.N. FOWLER, DEPUTY AND ACTING DIVISION DIRECTOR, DIVISION OF POLAR PROGRAMS, NATIONAL SCIENCE FOUNDATION

Mr. Chairman, the National Science Foundation's perspective on the U.S. program for Antarctica begins with two basic points: (1) scientific research is the primary expression of the U.S. effort to maintain an active and influential presence in Antarctica, and (2) the entire U.S. research and logistics operation in Antarctica is to be managed and funded by the NSF as a single package.

Policy for Antarctica

The decision to give scientific research and the Foundation this important role is the result of a series of detailed reviews and analyses of U.S. policy objectives.

The latest of these was a 1983 indepth review by the Office of Management and Budget. A copy is included with this testimony as attachment 1. The review concluded that to permit maximum efficiency in the management of a complex scientific and logistical enterprise, there should be a single agency program manager, with program-related funding included in that agency's budget. Over the past decade, NSF has proved to be a competent manager of the antarctic program and has utilized the capabilities of other agencies effectively on a reimbursable basis. There is no single other agency that would be a logical replacement for NSF as program manager. In view of the above, the President on 5 February 1982 reaffirmed the role of NSF as the manager of the antarctic program, including funding responsibility.

After a thorough review of U.S. objectives in the Antarctic, including an assessment of alternative program and funding levels, the President also reaffirmed the policy that "...the United States antarctic program shall be maintained at a level providing for an active and influential presence in Antarctica designed to support the range of U.S. antarctic interests." Within these policy guidelines, every effort will be made to ensure that this program is carried out in a prudent and cost-conscious manner and not in competition with other NSF programs.

U.S. policy for Antarctica is founded on support of the Antarctic Treaty and emphasizes the open and cooperative conduct of scientific research as the principal U.S. activity there. Following is a list of U.S. policy goals:

1. To maintain the Antarctic Treaty and insure that this continent will continue to be used for peaceful purposes only and shall not become an area or object of international discord.

2. To foster cooperative scientific research for the solution of worldwide and regional problems including environmental monitoring and prediction and assessment of resource potential.

3. To protect the antarctic environment and to develop appropriate measures to insure equitable and wise use of living and nonliving resources.

4. To promote the free exchange of information.

5. To maintain a suitable presence in Antarctica which continues to provide leadership in the development of the area, which preserves U.S. rights and which protects future national interests in Antarctica.

Scientific importance of Antarctica

In the Foundation's view the national interest in Antarctica has important scientific significance beyond that expressed in the statement of national policy. This stems from our understanding that Antarctica:

--Exerts a major influence on how the world's oceans and atmosphere behave. A detailed understanding of this influence is of major importance in understanding the evolution of the world's weather and climate;

--May contain significant living and mineral resources, the scientific understanding of which is an important base line for developing wise international management;

--Provides an outstanding opportunity and environment for international cooperation and research support, which sets an important precedent that we hope will carry over into all aspects of negotiating the international political management of this unique continent;

--Because of its remoteness from the heavily populated areas of the world, provides a unique site for long-term baseline measurements related to environmental pollution problems.

Comparison with other nations' antarctic programs

I would like now to comment briefly on some of the relationships and comparisons of the U.S. antarctic program with those of other countries. The U.S. program is one of the two largest national programs in Antarctica, the Soviet Union's program being the second largest. Only the U.S. program, however, has the reach and flexibilty of effort provided by our ski-equipped LC-130 Hercules airplanes operated by the Navy VXE-6 squadron. These heavy-lift turboprops allow us to place scientists and stations virtually anywhere in the 5.4-million square mile continent, though our program has evolved with emphasis on West Antarctica.

Our general guidance is to maintain an inland station and two coastal stations. The inland station, Amundsen-Scott South Pole, is a site of scientific significance as well as the convergence point of the several sector claims of national sovereignty, none of which is recognized by the U.S. and all of which are frozen by the treaty. One of the coastal stations, McMurdo Station, is the logistics hub and resupply point of our continental program with a peak austral summer population of 900 individuals.

Other nations' programs in Antarctica depend almost exclusively upon once-a-year resupply and personnel changeover by ships calling at coastal stations, augmented in a few cases by very expensive resupply of inland stations by overland traverse. The United States is able to relocate scientists and stations by airlift almost anywhere at any time during the austral summer. Among other things, this capability makes it possible to employ outstanding scientists in our program without committing them to a full year's stay in Antarctica.

The New Zealand program is closely linked with our program because our major staging base is located at Christchurch, New Zealand, and because the two New Zealand stations in Antarctica are very close to McMurdo Station. This cooperation is based on a longstanding U.S.-New Zealand arrangement of cooperation.

We have many other mutually supporting efforts underway and a rich exchange of scientists and technical personnel with other national programs such as Australia, France, Japan, United Kingdom, and the Soviet Union. We also have a number of cooperative programs with these nations and others such as Argentina, Chile, Norway, Poland, and West Germany. The U.S. Antarctic Research Program demonstrates leadership in its scientific research and operational capability, while contributing to and richly benefitting from a truly international cooperative program in Antarctica.

History of U.S. scientific interest in Antarctica

U.S. research interests in Antarctica have evolved from the early nineteenth century when in 1820 Captain Nathaniel Palmer, a sealer from Stonington, Connecticut, discovered the Antarctic Peninsula. In 1839, Lieutenant Charles Wilkes, United States Navy, charted 1,500 miles of East Antarctica's coastline and added proof of the existence of the continent. Fifty-five years ago, on 29 November 1929, Richard E. Byrd made the first aircraft flight over the South Pole and recorded a number of scientific observations. U.S. interests thus evolved from discovery through exploration to scientific study by the time of the International Geophysical Year of 1957-1958. The IGY marked a turning point in our understanding of this vast new continent and its importance in global processes, and led to the precedent setting Antarctic Treaty, which was signed in Washington, D.C., 25 years ago, on 1 December 1959. Since the IGY, the U.S. science program has undergone a gradual shift toward more detailed analyses and the study of specific natural phenomena.

We now know that the plate upon which Antarctica rests is a sort of keystone in global tectonic processes recognized as continental drift. Indeed, it is now generally accepted that all the southern hemisphere continents were once joined in one land mass called Gondwana, with present-day Antarctica at the center. Because the major southern oceans of the world - the Atlantic, Pacific, and Indian - converge in the intense circulation around

Antarctica, we know that this area has a major role in global oceanic processes, with most of the oceans' deep bottom waters originating in Antarctica by some process as yet poorly understood. It is also clear that the global atmosphere is strongly influenced by the presence of the high, dry, and extremely cold antarctic land and ice mass.

Ongoing U.S. scientific research in Antarctica

The U.S. Antarctic Research Program is managed in the five disciplines of atmospheric, earth, ocean, biological, and glaciological sciences, and the research will be described in these groups below. Attachment 2, submitted for the record, contains brief descriptions of all of the research projects to be supported by NSF in these areas in the coming 1984-1985 austral summer. The following is a summary of noteworthy achievements to date in these disciplines.

Biology and Medicine

Research in the life sciences conducted by the United States Antarctic Research Program is directed both to obtain an increased understanding of organisms and ecosystems native to Antarctica and its surrounding seas and to utilization of these organisms and the isolated human populations at research stations as tools to study problems of general biological interest that are best pursued in Antarctica. This research has markedly expanded knowledge in four general areas: adaptations of organisms to the antarctic environment, population dynamics of antarctic species, structure and function of ecosystems, and medically oriented research. A general description of the structure and function of antarctic marine, freshwater, and terrestrial ecosystems has been developed with a strong marine emphasis since in every way it is overwhelmingly the dominant antarctic ecosystem. The results of the marine research -- in addition to broadening and deepening basic understanding of the southern ocean ecosystem -- are providing information necessary for implementing the Convention on the Conservation of Antarctic Marine Living Resources and form a United States contribution to the international BIOMASS (Biological Investigations of Marine Antarctic Systems and Stocks) program. The Convention which the United States was a leader in developing specifies that the harvest of krill and other marine organisms be done in a manner that does not harm the overall ecosystem. The shrimp-like crustacean, krill, is already the basis of a substantial fishery and one capable of and likely to undergo marked expansion in the future. The BIOMASS program was developed by Antarctic Treaty nations as a mechanism for developing information needed for a rational and sustained krill fishery.

In addition to ecosystem-oriented research, work has been conducted on the population dynamics of antarctic species, on the biochemical, behavioral, and other adaptations of organisms to the antarctic environment, and on medical aspects of isolated human populations at antarctic stations. Research on the population dynamics and behavior of seals, penguins, krill, and other important species has yielded part of the information essential for understanding and managing the antarctic marine ecosystem. The biochemical studies, in addition to yielding new knowledge concerning the abilities and limitations of life in adapting to an extreme environment, have provided guidance in designing synthetic substances to increase the freezing resistance of crop plants. These substances act in a manner similar to the natural antifreeze glycoproteins found in many antarctic fishes.

The antarctic stations offer a unique combination of small populations isolated from other human contact for months and an atmosphere that is essentially sterile and free of virus and bacteria and thus provide unique situations for studying the transmission of virus. This research has led to the development of a virucidal paper handkerchief (now undergoing commercial development) that significantly reduces the dissemination of infective virus particles.

In addition to topics mentioned above, ongoing research in the life sciences includes work on age structure and population dynamics of fishes, adaptations of Weddell seals to deep (more than 500 meter) dives, interstitial flora of antarctic rocks as a possible analog to extraterrestrial life, and other projects relevant to both basic and applied science. Most important are two major shipboard projects examining the physical, chemical, and behavioral processes underlying the formation of krill aggregations and the ecology of the ice edge environment. The former has obvious importance in the management of any krill harvest and thus in the maintenance of the overall antarctic marine ecosystem. The ice edge is a major habitat since at its maximum extent the seasonal sea ice surrounding Antarctica covers an area roughly equal to that of the continent. Many casual observations and a few measurements suggest that the ice edge is a region of greatly elevated primary production and active feeding by krill and other consumers, especially during the retreat of the ice in austral spring and summer. It thus is clear that information on the sea ice and ice edge habitats is needed for developing a thorough understanding of krill life history and other aspects of the marine ecosystem. The ongoing project AMERIEZ (Antarctic Marine Ecosystem Research at the Ice Edge Zone) recently completed a cruise off the South Orkney Islands with coordinated observations from an icebreaker working inside the pack and a research vessel working outside.

Earth sciences

In 1956, despite earlier exploration efforts, the Antarctic was virtually unknown. Practically no geophysical research had been done on or around the continent. Geological reconnaissance surveys had been made only in the Antarctic Peninsula, in western Marie Byrd Land, and along the routes from the Ross Sea to the South Pole. The ice sheets were thought to be less than a million years old. The map of Antarctic was almost entirely blank.

In 1957 the International Geophysical Year sparked the beginning of the modern era of U.S. earth science investigations in Antarctica. In their earliest phase, these studies involved basic data collection and the preliminary establishment of the geologic structure of the continent. Early scientific investigations determined the limits and extents of ice-free terrain, the general thickness and configuration of the polar ice sheet, and the nature, age, and structure of the exposed crustal rocks. In many parts of the continent this work of gathering fundamental geological data is still necessary and is an ongoing process.

These descriptive geographic, geologic, and geophysical studies have been largely succeeded by modern topical studies in the fields of geology, geochemistry, and geophysics. In addition, study of the antarctic continent is a central element in the reconstruction of the history and subsequent dispersal of the "super-continent," Gondwana. Theories about the geologic development and migration of the other Gondwana continents (Africa, South America, Australia, and India) must meet the critical test of agreement with data from Antarctica. For example, fossil marsupials are known from South America and modern-day marsupials are found only in the Americas and in Australia. The recent U.S. discovery of fossil marsupials on Seymour Island in Antarctica confirms the Gondwana-linkage of these continents and the migration of marsupials from South America to Australia via an antarctic land-bridge.

Similarly, the existence of Glossopteris (plant fossils from the Carboniferous Age) and coal deposits of the same age in South America, Antarctica, and India yield valuable information about the relative positions of these continents 300 million years ago.

Other current geological and geophysical programs will lead to a better understanding of Antarctica's mineral resource potential for commodities such as uranium, oil, chromium, cobalt, copper, etc. Ongoing studies of the modern-day distribution and activity of earthquakes and volcanoes in the Antarctic will allow earth scientists to develop models for the evolution of Mountains range.

Antarctica comprises a unique locality for studies in the earth sciences, several of which cannot be undertaken anywhere else. One such program is a meteorite recovery project. Because of the size and the age of the antarctic ice sheet, it represents a natural "collector" for meteorites which fall over this large area. As the ice flows toward the margins of the continent, the meteorites are carried, conveyor-belt fashion, to the edge of the ice sheet. At several localities along the edge of the ice sheet, particularly around elevated mountainous areas, the ice is subjected to winds, ablation, and sublimation leaving behind on the surface the meteorites that previously were contained within the ice. Meteorities are of fundamental importance because they contain valuable information about the birth and history of our solar system. The antarctic meteorite recovery program has doubled the number of meteorites available for study. Included among the collection of approximately 2500 meteorites are two of possibly Martian origin, and another almost unequivocally lunar in origin.

Antarctica has been shown to be unique among the continents in being free of earthquakes (except at the two offshore active volcanos) and in having a continental shelf that is depressed to about 700 meters below sea level.

Another project, possible only in Antarctica, is long-period seismic and gravity observations at the South Pole Station. The observation site is virtually on the earth's rotational pole, and the rotational velocity at this point is near zero. Thus large earthquakes occurring elsewhere in the world are recorded at the Pole Station yield fundamental information about the deep structure and composition of the earth's core and surrounding mantle.

Our glacial-geological studies have shown that the present broad glaciation of Antarctica began at least 20 million years ago. Evidence suggests that the dynamics of antarctic glaciation is the key to major world climate variation and to glacial periods in the northern hemisphere. Particularly strong evidence is being developed that relates the glacial history of thr Ross Sea area to glacial and other paleoclimatic events in the rest of the world.

Glaciology

Only 17,000 years ago an ice sheet larger than the present antarctic ice sheet covered much of North America. We have learned that such ice sheets periodically advance and retreat. Study of the remaining ice sheets in Greenland and Antarctica is revealing much information on when and why ice sheets change, as well as information on less dramatic climatic variations during decades or centuries.

The climatic significance of the polar ice masses was realized by scientists who started exploring the Antarctic around the turn of the century. But a systematic study of the region did not become technically feasible until after the last world war. The United States opened the continent to systematic glaciological study with Operation Highjump (1946-1947), which aerially mapped the ice margins (this needs to be repeated periodically but now can be carried out from satellites). There followed the International Geophysical Year (1957-1958) with the first major surface traverses to the interior, which provided valuable data on ice thickness, snow accumulation, and temperature. These activities brought back a wealth of new scientific data requiring years of patient analysis and, as immediate practical payoff, expertise in ice engineering and oversnow transportation techniques.

In the next phase, scientific attention turned to the interior of the ice, where the main clues to its behavior must be sought. Core drilling in ice, which had been pioneered by U.S. workers during the IGY, now has achieved the only three holes so far drilled completely through polar ice sheets - two in Greenland, and the deepest, to 2,164 meters, at Byrd Station, Antarctica. The ice cores extracted from these and several earlier but shallower holes provided unique information about past climates and gave rise to a completely new science, ice geochemistry, which U.S. scientists developed in collaboration with European groups in Denmark, Switzerland, and France.

Another U.S. idea, the sounding of ice thickness with radar waves, was taken up by British scientists and developed into a joint U.S. - U.K. project of systematically mapping the surface and bottom topographies of the polar ice sheets. This showed, as unexpected features, internal discontinuities not yet fully understood. The discontinuities relate to ice mechanics and to ice history. This research field became one of international cooperation, involving the United States with Denmark and the United Kingdom, and resulted in maps of Antarctica showing the structure and the thickness of the ice sheet.

The newest developments have been in remote sensing of ice properties from satellites. An especially crucial new achievement is the ability to measure position precisely, thus making it possible to determine directly the rate of ice flow at points far removed from any fixed landmark, such as a mountaintop penetrating above the ice. These advanced U.S. satellite systems are being exploited both in the U.S. program and in collaboration with other national expeditions.

In these ways there have been and are being assembled the facts needed for reconstructing, by measuring and by computer modelling, the history of various sections of the antarctic ice sheet. This constitutes a scientific task of first importance. The histories and their climatic implications can then be projected into the future and serve as background for environmental planning.

Particular problems include (1) determining the size and shape of the ice sheet, (2) determining the mass balance: whether the ice sheet is growing or shrinking, (3) understanding the flow dynamics and flow stability of the ice masses, (4) extracting the record of such prior environmental conditions as air temperature, dust, and precipitation, and (5) understanding the influence of ice sheets on global conditions and their responses to changing conditions. Overall, there is the problem if assembling all the facts (by measuring, analyzing, and computer modeling) necessary to reconstruct the history and project the future of the earth's ice sheets.

Selected achievements

o Glaciological exploration of Marie Byrd Land and Victoria Land, and of the Ross and Filchner Ice Shelves, gave surface shapes, ice thickness, temperatures, and accumulation rates.

o Ice core drilling at Little America and at Byrd Station allowed determination of chemicals (natural and manmade) and dust (terrestrial and cosmic) in present and past antarctic atmospheres and determination of ice crystal features relating to ice history and governing ice flow.

o Deep drilling penetrated the antarctic ice sheet to permit analysis of ice as old as several hundred thousand years.

o Ice geochemical studies resulted in determination of (1) past atmospheric temperatures from stable isotope ratios and (2) the age of ice from radioactive isotopes, and (3) paleoclimatic data.

o Regional exploration since the mid-1960s has included surface traverses over the high antarctic plateau and studies of special glaciers and ice features on antarctic islands.

o Aerial remote sensing techniques were developed for recording ice sheet surface and base rock topographies; three-fourths of Antarctica has been mapped using this system.

Meteorology

Research in antarctic meteorology is directed toward understanding the physical processes peculiar to the antarctic environment and determining the role Antarctica plays in modulating global weather and climate. Past and current research topics include continental synoptic climatology, barrier and katabatic (gravity-driven) winds, ice crystallization and ice sheet precipitation processes, radiative energy transfer mechanisms, and studies of trace gas concentrations in the atmosphere as well as in the snow and ice.

Since atmospheric processes are globally linked, knowledge of antarctic synoptic meteorology is necessary for an understanding of the large-scale dynamics of the atmosphere, the modelling of atmospheric processes, and the improvement of long-range weather forecasting. The high surface elevation, horizontal homogeneity, and low surface temperatures of the antarctic interior combine to produce an extremely stable structure with unique low-level wind regimes and precipitation processes not duplicated elsewhere on such a large scale. Synoptic meteorological observations carried out at U.S. manned stations as well as by automatic weather stations provide valuable information for these investigations. Recent results of a study of the anomalously cold northwestern Weddell Sea area show that the generally north-south trend of the Antarctic Peninsula combined with the ice shelves on its eastern side produce strong, persistent, and very cold winds. These terrain-induced barrier winds exert a profound effect on the regional climate by accelerating the northward motion of sea ice, icebergs, and cold water masses.

The polar regions are particularly sensitive to variations in the earth's climate, and it is generally believed that the first indication of a climate change would be noticed in Antarctica. The study and monitoring of a variety of trace gases and atmospheric parameters which have potential climatic implications is an important continuing part of our antarctic meteorological program. These observations are carried out at a clean air facility maintained at the South Pole and at a smaller facility at Palmer Station.

Selected achievements

o Routine synoptic observations in the Antarctic as part of the World Weather Watch (WWW) have closed one important gap in the global meteorological observation system (the last major one remaining is over the southern ocean). This has substantially advanced understanding of the global fluid system and the development of global numerical models of the atmosphere.

o Studies of long-term statistical data of antarctic meteorological observations are beginning to shed light on worldwide climate patterns. These studies are likely to be increasingly important in future climate research and prediction schemes.

o Meteorological studies at coastal and interior antarctic stations revealed important features of the thermal structure and wind circulation of the atmosphere over Antarctica and nearby oceans.

o Unexpected great contrasts during winter between tropospheric and stratospheric circulations were discovered: numerous moving cyclonic vortices ventilate most of the antarctic troposphere with marine air while, at the same time, the lower stratosphere is dominated by a single large cyclonic vortex, generally somewhere over the central polar plateau.

o Year-to-year variations in the general circulation in the Antarctic were discovered to be quite large, as evidenced by extremely large year-to-year changes in temperature. This is a useful index of climate variability that has been correlated successfully with northern hemisphere climatic parameters, demonstrating the global nature of climate variations.

o Extensive studies of heat balance and heat transfer at U.S. stations gave the first comprehensive insights into the climatology of the antarctic continent, explaining the so-called coreless winter temperature phenomenon.

o Studies to date have shown ice crystal precipitation from clear skies likely to be a major factor in the mass and the energy balance of the antarctic plateau. This peculiar phenomenon has been detected at all inland stations on the high antarctic plateau and appears to be an important feature of the tropospheric circulation.

Oceanography

The antarctic ocean sciences program supports research into ocean and ocean-related processes at high southern latitudes. Major program objectives are to support physical, geological, and chemical studies of the southern ocean, to interpret the geological history of Antarctica as recorded in the oceanic sediments, to investigate the relationship between oceanic and atmospheric circulation systems, to determine the dynamics of antarctic water masses, currents, and sea ice, and to investigate the climatic effects of oceanic energy transport. The research projects that are supported make use of aircraft, icebreakers, chartered research vessels, and foreign-flag vessels.

Research in the ocean sciences under the U.S. Antarctic Research Program began in 1962 with a systematic oceanographic survey using USNS Eltanin. The 55 cruises of this research ship provided a basic framework of knowledge in physical oceanography, marine chemistry, and marine geology and geophysics, as well as other ocean sciences, that produced a three-dimensional picture of the southern ocean with global implications in the formulation of oceanic process models. In particular, the observation of symmetric magnetic reversals in the oceanic crust around mid-oceanic ridges in the southern ocean validated the theory of sea floor spreading, and established the reality of plate tectonics as the primary geophysical process of the Earth. Hydrographic surveys established that the Circumantarctic Current was much more complex than had been thought, with bottom topography propviding a dynamic stabilizing mechanism for its location, but also responsible for regionally splitting the current into several branches, and initiating long standing waves downstream of major ridges.

With the end of the circumantarctic survey, antarctic oceanography entered an analysis phase in which answers are sought to significant, well-formulated questions. Recent programs include research on the formulation processes of Antarctic Bottom Water, a cold and very dense water mass that sinks and spreads globally, on the identification and interpretation of fossil evidence in the ocean bottom sediment of long-term climatic variations and cycles, and on the establishment of upper mantle plume convection as the driving force for sea floor spreading at the edge of the antarctic tectonic plate.

Present-day programs emphasize the multidisciplinary nature of environmental problems. The recent Weddell Sea Polynya Expedition was a joint program with the USSR to obtain the first systematic winter data set on the physical, chemical, and biological structure of the southern ocean using the R/V Mikhail Somov, a Soviet ice-strengthened research ship. Its additional objective was to investigate, if possible, the air/sea energy exchange mechanism in the Weddell Sea Polynya, a large area of open water within the ice pack. Other programs concern the interrelationships among ocean, atmosphere, and ice in the extensive upwelling that stimulates very high biological activity, and the continued measurement of such geophysical parameters as gravity and magnetic anomalies and heat flow to integrate the observed regional sea floor pattern into the global tectonic framework.

The most productive directions for research lie in areas where rapid advances in both conceptual thought and sinstrumentation are occurring, and in areas where significant global problems have unique antarctic components. An example of the former is the development of wide swath bottom reflection profiling, which when coupled with magnetic and gravity anomaly measurements will allow a much more precise and detailed analysis of such tectonically complex regions as the Drake Passage and the Scotia Sea. An example of the latter is the antarctic response to the mechanisms that create the Earth's climate and its variations. The coupling of polar, subpolar, and tropical climate regimes occurs to a great extent through large-scale oceanic energy fluxes whose dynamics are as yet imperfectly understood. Additionally, radiative heat transfer between the ocean and the atmosphere is modulated by the seasonal sea ice cover, producing interactive feedback processes that directly affect the workings of the antarctic heat sink.

Since the southern ocean is remote and distances between ports are great, antarctic research cruises are difficult to schedule and areas of work are severely circumscribed. When the frequently bad weather is added to the geographical difficulties, it becomes clear that the return of scientific knowledge requires a large investment of time and effort and funds by antarctic researchers. The investment will continue to be made since antarctic oceanic processes directly affect global changes in sea level, sea ice extent, oceanic circulation, and world climate.

Upper atmosphere research

Antarctica is ideally situated for a number of important studies of the earth's upper atmosphere and near and far space environment, some of which can be done only from Antarctica. Research topics in upper atmosphere physics include studies of cosmic rays, infrasonic waves, magnetic and electric field variations, electromagnetic wave-particle interactions, very-low frequency (VLF) and ultra-low frequency (ULF) wave phonomena, the plasmapause region of the magnetosphere, the magnetospheric cusp, magnetosphere-ionosphere interactions, and global oscillations of the sun.

VLF anf ULF wave research at U.S. antarctic stations have led to a number of important results including the discovery of the plasmapause region of the earth's magnetosphere, the inadvertent modification of the magnetosphere by electromagnetic radiation from electric power lines and VLF transmitters, the precipitation of charged particles from the magnetosphere caused by VLF and ULF waves, and more recently the discovery of a new generating mechanism for ULF waves by energetic particle precipitation into the ionosphere. These VLF and ULF wave studies at Siple Station are continuing with an emphasis on understanding the nature of wave-particle interactions, particularly the conditions under which VLF and ULF waves cause the precipitation of energetic particles from the magnetosphere, the effects these wave-particle interactions have on the ionosphere, and on the magnetospheric particle population.

Considerable interest has developed in research in solar astronomy at the South Pole. The sun is above the horizon continuously at a relatively constant elevation for several months of the year. The site is ideally suited for extended continuous observations of solar global oscillations which provide information on the internal structure and dynamics of the sun. Results gathered during the next few years should revolutionize our understanding of the solar interior, and the observations from the South Pole will play an important role in this advance.

Another area of significant opportunity in polar upper atmosphere physics is the study of the magnetospheric cusp where particles and waves from interplanetary space penetrate deep into the magnetosphere to altitudes as low as the ionosphere. The South Pole is located directly beneath the magnetospheric cusp, and thus is ideally situated for investigations of this important but poorly understood boundary region of the magnetosphere.

Selected achievements

o A correlation has been noted between the occurrence of magnetic field micropulsations during magnetic storms and the failure of power lines and telephone communications. Preliminary understanding of the cause-and-effect relationship already has led to the design of equipment that obviates some of these disturbances and failures. Research in this area eventually can be expected to lead to a better understanding of the plasma in which these micropulsations propagate, and therefore of the plasma in which fusion energy reactions take place.

o Thunderstorms in southeastern Canada produce very low frequency (VLF) radio emissions that have been detected at geomagnetically conjugate points in Antarctica. Analysis of this phenomenon led to discovery of the plasmapause, a relatively thin region of anomalously intense wave-particle energy exchange. Further study of the plasmapause is essential to understanding energy exchange in this part of the chain of energy between its solar origin and its eventual use by man.

o Data from Eights Station demonstrated that natural VLF emission can change the radio wave propagation properties of the ionosphere in ways that double the amplitude. These changes enhance the detectability of artificial radio waves. Experiments are now in progress with artificial VLF emissions that can lead to controlled increase or decrease of radio wave amplitude.

o Correlation of natural VLF wave activity and simultaneous particle precipitation observed at the geomagnetic conjugate stations Siple, Antarctica, and Roberval, Quebec, has shown that electron resonance is an important mechanism responsible for electron precipitation from the magnetosphere and for the generation of natural VLF radio wave emissions. These results imply that the loss of energetic electrons from the radiation belt, with the consequent ionospheric effect, can be controlled through artificial stimulation with a VLF transmitter. Attempts to accomplish this are in progress.

o Relationships have been noted among the precipitation of energetic electrons, the occurrence of geomagnetic activity, and phase perturbations of nighttime subionospheric VLF transmissions at mid-latitudes. The relationships are being analyzed to increase understanding of the cause of previously anomalous disturbances in navigation and communication systems based on long-range VLF transmission.

o In cosmic ray research, low energy solar particles can be accelerated to relativistic energy (1 billion electron volts) in interplanetary space by bouncing between two shock fronts, the second of which moves faster than the first. This may well be the mechanism whereby galactic cosmic rays are produced by supernovae. Observation at South Pole Station (the world's only cosmic ray observatory at high altitude and latitude, where the sensitivity is greater than at any other existing station) provided the crucial data that revealed this new phenomenon.

o Solar cosmic rays always initially propagate along the spiral magnetic field line that connects the sun with the earth. Even when they are produced on the backside of the sun, they can travel as far as 90° in helio longitude at a rate of 5° per minute (a measured number using flare time and earth arrival time), contrary to the latest diffusion theory prediction of 1° per hour. The propagation mechanism is not yet understood and poses a theoretical challenge. On the other hand, an old mystery concerning the distribution over the solar disk of flares that produce 1-billion electron volt particles has been solved. The former asymmetrical picture, in which the central meridian of the visible disk was the reference (homocentric) has been replaced by one in which the foot of the sun-earth spiral field at 60°W. helio longitude is the center of a symmetrical distribution extending about 90° in each direction.

Specimens, maps, and publications

Since 1962, the United States' National Science Foundation has worked to insure the availability of data, specimens, and information resulting from the U.S. antarctic program. Its Polar Information Program is a clearinghouse and source for this material. Research results and plans are exchanged freely with the other Antarctic Treaty nations.

Specimens

o The Smithsonian Institution has preserved, sorted, cataloged, and distributed to scientists the world over, more than 6 million antarctic natural history specimens since 1964. These specimens make analysis in sophisticated laboratories possible without travel to Antarctica.

o A specimen library at Florida State University contains over 11,000 meters of sedimentary core and 4,000 kilograms of ocean-bottom rocks taken from antarctic waters. Scientists from all over the world have studied more than 200,000 samples from the collection.

o The State University of New York at Buffalo curates ice core samples from Greenland and Antarctica, including the world's only three cores drilled through the polar ice sheets to bedrock. Core samples are made available to all qualified scientists.

Maps

o Since the IGY, aerial photographs for mapping have been made of 1,500,000 square kilometers of Antarctica. Following establishment of ground control points, 79 maps at a scale of 1:250,000 were produced covering 889,000 square kilometers of previously unmapped areas were produced. A number of special maps at smaller and larger scales also were made. This concentration of effort was primarily in West Antarctica in support of the U.S. field programs. The maps establish accurate positions and shapes of the coastline, locate previously unknown mountain masses and glaciers, delimit ice shelves and ice-free areas, and show other significant landmarks such as crevassed areas. This effort, not yet complete, represents a major contribution to southern hemisphere geography.

o Three editions of an 80-mile-per-inch map of Antarctica were produced. The latest was published in 1970 and is being updated.

o The American Geographical Society completed the 19-part Antarctic Map Folio Series. Together these folios constitute the world's most complete and up-to-date physical atlas on the antarctic.

o The Defense Mapping Agency Topographic Center is the repository for officially recognized antarctic place names. A gazetteer, published in 1956, was revised in 1966, 1969, and 1980. Some 12,000 names are now listed.

Publications

o U.S. antarctic researchers publish some 150 professional papers a year in the primary scientific journals.

o The American Geophysical Union of the National Academy of Sciences has published 35 volumes of the Antarctic Research Series since 1964. Each volume contains lengthy original papers describing results of U.S. antarctic research projects. The series has a high scientific reputation and is distributed internationally.

o Antarctic Journal of the United States, published five times a year by the National Science Foundation, reports on field activities and preliminary research results in the U.S. program. It is distributed internationally on subscription from the Government Printing Office.

o Some 150 Russian-language journals or periodicals and 100 Russian books have been translated into English for use by U.S. scientists. A translation journal, Polar Geography and Geology, has been in operation since 1977.

o The Library of Congress compiles the Antarctic Bibliography. Since 1962 over 34,000 titles, covering the publications of all nations, have been listed, abstracted, and indexed. An accession list is distributed monthly, and volumes are sold at 18-month intervals by the Government Printing Office.

o Citation analysis has shown that U.S.-supported antarctic research has been at the center of intellectual change in numerous scientific disciplines, particularly plate tectonics and magnetospheric processes. In addition, 70 percent of the antarctic papers that have become citation classics (papers cited more than 50 times) were written by U.S. scientists.

Planned scientific research

Because the policy for Antarctica postulates a research program that can be responsive to all future U.S. interests, flexibility is a key consideration in the Foundation's planning for future scientific research. The Foundation's usual procedure of receiving and evaluating research proposals generated by the scientific community is therefore appropriate to much of our planning.

Nevertheless, the Foundation seeks to focus scientists' attention on compelling research opportunities. It achieves this focus by two principal means.

One is to plan and implement temporary operational/logistics camps at locations of interest. We have gained considerable experience with the establishment of larger remote field camps capable of supporting research in several disciplines as a sort of secondary logistics hub. Such camps permit highly efficient use of logistic support, heighten the team spirit among the scientific, contractor, and naval personnel, and increase opportunities for cross-discipline scientific ideas. Camps have been established in recent years at the Darwin Glacier, in Marie Byrd Land, in the Ellsworth Mountains, and in northern Victoria Land. These camps and helicopters are delivered by Hercules aircraft to the sites except when within helicopter range of our logistics hub at McMurdo Station, as was the Darwin Camp. Several semi-portable Jamesway buildings are constructed with power supplies by portable generators. Local mobility is provided by a detachment of generally three helicopters.

The second means of focusing research attention is through the support of studies specifically directed toward planning future research priorities. A number of these studies have been completed by the National Academy of Sciences at the Foundation's request, most recently in 1983. This report, titled Research Emphases for the U.S. Antarctic Program, identifies a small set of major scientific questions of outstanding importance in antarctic research, recommends priorities among them as a guide to program planning, and suggests a variety of large-scale integrated research projects and smaller, more specific projects through which particular research questions or groups of questions could be addressed. Together with basic ongoing data-gathering and monitoring activities, these projects would constitute a timely, balanced, and scientifically productive U.S. Antarctic Research Program. The Academy recognizes that the projects suggested are not the only means of addressing the questions posed and that the NSF will continue to stimulate and support proposals from the scientific community in order to further the scientific objectives of the U.S. Antarctic Program.

The selection of large- and small-scale projects and the sequence of their initiation will of course continue to be tied to the fundamental scientific questions and opportunities in antarctic research. Attachment 3 is a copy of the academy report.

The descriptions of science programs above indicate that the basis for planning the work of the scientists is singularly dependent upon the logistics and support provided by the civilian contractor, by the Navy, and by the Coast Guard.

Operations in the Antarctic

I would like to describe for you the logistics effort in Antarctica required to support the research program, and then describe some of the objectives of the research program.

With funding from the National Science Foundation the Department of Defense, primarily the United States Navy, provides much of the logistics in Antarctica. The Department of Transportation provides U.S. Coast Guard icebreaker services. A contractor operates South Pole, Siple, and Palmer stations and the R/V Polar Duke, and performs construction.

A long-time mainstay of the operation is the icebreaker Glacier, built 1956. Although Glacier is smaller and less powerful than the Polar Sea and Polar Star, it is a reliable ship. The Westwind, a Wind-class ship like Northwind, supported research near the Antarctic Peninsula during the 1983-1984 austral summer. Each season, the icebreakers prepare a channel in McMurdo Sound through the fast ice, which usually extends 20 miles from the station at ship resupply time in January. This process used to take several weeks; the new Polar-class icebreaker takes less than a day to make the initial break-in and can usually complete the channel in an additional two to four days. We use two ice strengthened ships, the tanker USNS Maumee and until this year the cargo ship Southern Cross; beginning in 1984-1985, a commercially contracted freighter M/V Green Wave replaces Southern Cross.

Our air operating capability in Antarctica is the world's best in that we have seven ski-equipped Hercules (LC-130s). These airplanes can land on skis or wheels and give us flexibility to carry out field activities virtually anywhere on the continent. The six helicopters of the navy flying squadron are UH-1N Hueys. These helicopters are transportable in the Hercules--a combination that enables us to operate in many different places in Antarctica.

We also charter Military Airlift Command C-141s for the early season lift into McMurdo when the sea ice can be used for wheeled aircraft landings. (The sea ice is renewed annually and, unlike the glacial ice, is relatively smooth and level. However, by mid-December the ice surface is pocked with melt holes and no longer suitable for wheeled aircraft.)

There are two inland and two coastal stations. Resupply of the coastal stations is by ship, and we transport fuel and other material onward from McMurdo to the inland stations by Hercules.

The northernmost of our stations is Palmer. The annual resupply is not made difficult by severe sea ice conditions, and the temperatures are mild enough that the fuel consumption is not great. The station operated until 1984 with the small research vessel Hero, which transported most of the people to and from the station as well as doing direct science work and moving field parties about in the Antarctic Peninsula area. Hero is a wood ship, now 16 years old, and will be replaced in 1984-1985 by the chartered 219-ft research ship Polar Duke.

Siple Station is built on ice in an area of heavy snow accumulation and has a limited life expectancy. We anticipate that this station will become unusable due to snow accumulation by about 1987. To extend its life, Siple Station closed on 20 January 1984 and will reopen in November 1985 for important upper atmosphere experiments.

Amundsen-Scott South Pole Station, located at the geographic pole, is probably the best known of the U.S. facilities. Most of the buildings are inside an unheated geodesic dome; adjoining archways house the fuel and generating plant. As with Siple, this station is supplied entirely by Hercules airplanes.

Our main station is McMurdo and its airport Williams Field, the staging base for South Pole and Siple. In addition to Williams Field, the McMurdo Station complex includes an ice runway. The station is the locale for much of our austral summer science activities. It is also our seaport and main communications center.

Other support items include field camps, such as tent camps and larger field camps with local helicopter support situated in isolated areas of special scientific significance.

Senator GORTON. Mr. Fowler, thank you very much for not only an excellent summary, but for magnificent material which will be of great help to us.

We will now hear from Dr. Byrne.

STATEMENT OF HON. JOHN BYRNE, ADMINISTRATOR, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, DEPARTMENT OF COMMERCE

Dr. BYRNE. Thank you, Mr. Chairman.

I am John Byrne. I am the Administrator of the National Oceanic and Atmospheric Administration. I think it will be easy to shorten my comments inasmuch as what I have in my statement, which you have indicated would be included in the record, has already been stated by some of the previous speakers.

Nevertheless, there are a few points I would like to make, and I would like to address some of the activities that NOAA has been involved with in and related to the Antarctic. I think one of the critical elements to keep in mind is that the Antarctic Treaty activities that we are discussing are part of a system, and by virtue of that system we have flexibility, but we also may have some problems.

The flexibility has led to the success, I think, of the system to date, a success which to a great extent can be attributed to the cooperative spirit which was generated during the IGY and which has been carried through by IGY activities and also by activities of the Scientific Committee on Antarctic Research.

The ability of the various components of the treaty system to function is largely dependent on communication among this group of scientists, and more recently also a group of diplomats. The components of the system have all been alluded to or mentioned specifically.

Those that we would focus on today most specifically are the Convention for the Conservation of Antarctic Marine Living Resources. However, there are others involving the conservation of Antarctic seals, the development of activities involving mineral deposits, and so on. These have all been commented on.

I think one of the virtues of the system is that it has been responsive to changing needs as they have developed over the past 25 years, and so I think the important element to remember here is the flexibility, the ability to respond to changing circumstances.

The Antarctic Treaty lends itself to multiple legal and political interpretations, and this desired creative ambiguity has enabled the consultative parties to take important steps in the management of activities in the Antarctic without prejudice to differing legal positions.

This is certainly an innovative approach to international activities. Another innovation which we would point to with respect to the Antarctic Treaty system is the ecosystem approach to the management of living resources. We are optimistic that this will be successful. It will serve as a model for other types of international agreements involving living resources if it is successful.

In spite of the success of the Antarctic Treaty system to date, we in NOAA view two tests which are extremely important at this time. The first is that which has been mentioned by Mr. Scully with respect to the United Nations study of Antarctic Treaty activities and other activities.

The test, of course, is the implication that resulting from the study there may be an attempt to produce a radical restructuring of the treaty system. We believe on the basis of the success we have had to date that such an attempt to restructure the system is not warranted.

A second test which is an ongoing test is one which is created by, in a sense, the very success of the system. That is that as the system has evolved through a number of conventions, a number of groups of recommendations and so on, there needs to be some way of assuring that there is consistency from one convention to another.

This will be an ongoing test. It is one which we believe can be passed successfully. We think that there are several ways by which consistency can be accomplished short of creating a single decisionmaking regime.

Many of these are activities which have been carried out to date. We can continue to rely on the tradition of impartial scientific advice provided initially by those involved in the IGY and now by SCAR. We can foster the institutional relationships between SCAR, the CCAMLAR Scientific Advisory Committee and other scientific groups dealing with Antarctica.

We can promote public access to scientific advice and decisions within the various regimes, and we can strengthen the decisionmaking process of each regime procedure which require consideration of other activities and decisions. In other words, keep all the elements informed of what the other elements are doing.

I have already mentioned the importance of CCAMLR as a creative response to an emerging Antarctic activity, and for NOAA that focuses on fishing. CCAMLR is important because it demonstrates the ability of the treaty system to deal with the new problem, and as I have already indicated, it is also important because it uses the ecosystem approach.

Others have commented on the success and the accomplishments of CCAMLR to date. In view of the fact that there have been three meetings, structures have been set up. There is an executive secretary who has been appointed. A chief scientist has been hired. A data manager has been hired. These things, we think, are substantial progress.

At the most recent meeting in early September the Commission adopted conservation measures for certain fin fish stocks. What this implies is that after the structure has been set up, we are now actively using CCAMLR as a management facility, as a management organization.

The United States has been involved significantly from the beginning of this activity and during the coming year we anticipate our involvement will continue at a high level. We will host a meeting on the status of ecosystem monitoring and assessment which will be attended by scientists representing parties to the convention.

The ad hoc working group on fisheries assessment will meet just prior to the next meeting of the Commission, and the Scientific Committee. We anticipate that NOAA will be heavily involved in this activity.

A third group was recently established. This is the ad hoc krill research working group. And we hope that the National Marine Fisheries scientists will continue to play a significant role in this area.

For us in NOAA, we regard as one of the most pressing actions required by the United States the passage of the Antarctic Marine Living Resources Convention Act, which implements CCAMLR. This bill would establish NOAA as the lead agency for the development of a research program, although it specifically focuses on the Department of Commerce.

NOAA requires such authority in order to be prepared to assume the research responsibilities now being planned and conducted under SCAR sponsorship. I think comments have been made about the mineral regime. We envision continued involvement in a secondary role for the agency in this activity. The activities involving mineral negotiations we think are important not only in their own right, but also because they focus additional attention on activities involving Antarctica.

And finally, before closing, Mr. Chairman, I would like to mention a few other activities that NOAA has been involved with, with respect to Antarctica. As you may know, we operate a series of stations called global monitoring for climatic change stations.

There are four of these stretching from Barrow, AK, to the South Pole. We maintain a two-man station at the South Pole as one of our base line observation systems. The South Pole station measures on a routine basis the carbon dioxide content of the atmosphere, the ozone content, the content of chlorofluorocarbons, nitrogen oxide, several components of solar radiation, various physical properties of atmospheric aerosols, and standard meteorological parameters.

We regard the measurements at this particular location as being extremely important in that they do give us some indication as to the changes which may be taking place in the total global atmospheric environment.

In addition to these, we have been involved with the biological experiments which have already been noted, including the first international BIOMASS experiment, FIBEX, in 1981 and 1982, in which NOAA funded a research project using acoustic techniques to survey krill populations. The experiment was part of the BIOMASS activity, the biological investigations of marine Antarctic systems and stocks.

The second international BIOMASS experiment, phase I, SIBEX, was designed to amplify the work done in FIBEX on krill abundance and distribution. This was completed in February. NOAA participated in phase I in cooperation with researchers sponsored by the National Science Foundation.

Scientists from our various laboratories use the research vessel *Melville* and a U.S. Coast Guard icebreaker to obtain information on the relationship between krill abundance and ocean circulation, particularly in the neighborhood of the ice edge front.

We are currently planning to participate in phase II during the coming austral summer as well as participating on a continuing long-term basis in assessment of the data collected from these two activities.

Finally, I would indicate that as part of our new initiatives in ocean services, we are attempting to provide through the National Ocean Service a better forecasting system for the entire global ocean, relying heavily on numerical models, on information obtained by the Navy, as well as by facilities that NOAA operates. These forecasting and numerical model activities will certainly include activities surrounding the Antarctic Continent.

Thank you, Mr. Chairman.

[The statement follows:]

STATEMENT OF HON. JOHN V. BYRNE, ADMINISTRATOR, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE

Mr. Chairman and Members of the Subcommittee: I am John V. Byrne, Administrator of the National Oceanic and Atmospheric Administration (NOAA). I am pleased to be here today to address topics regarding Antarctica.

The Antarctic Treaty System (ATS) consists of several components. Perhaps the most important of these is the Antarctic Treaty itself and the biennial meetings of the Consultative Parties (ATCPs) at which recommendations having to do with the various activities in Antarctica are adopted. These recommendations, when ratified by Consultative Party governments, constitute an elaboration of the provisions of the Antarctic Treaty in response to the needs created by man's activities on and around the continent.

The Antarctic Treaty has its origin in the International Geophysical Year (IGY) of 1957-58. The spirit of international cooperation nurtured by the scientists involved in the IGY was instrumental in setting the stage for the successful negotiation of the Antarctic Treaty in 1959. The personal and professional relationships of scientists working in Antarctica have influenced the tone and substance of discussions and agreements ever since. In fact, the ability of the various components of the Antarctic Treaty system to function in concert is largely dependent on communications within this group—which now includes diplomats as well as scientists.

The other elements of the ATS to which I refer include: the Convention for the Conservation of Antarctic Seals; the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR), the body of recommendations adopted by the Consultative Parties, the non-governmental Scientific Committee on Antarctic Research (SCAR) and, finally, the on-going negotiation of a regime to govern Antarctic mineral activities.

Each of these elements was created in response to actual or potential changes in man's use of Antarctica. In some cases, the ATCP's have moved to address questions related to activities not yet begun. This was the case with the Seals Convention and is arguably the case with the minerals negotiation. I say "arguably" since a considerable amount of marine seismic research has been carried out which has direct application to offshore oil development.

The important point is that the system is flexible. It has demonstrated its ability to respond to changing circumstances over the last 25 years. In doing so, it has been innovative in several respects. For example, the Antarctic Treaty lends itself to multiple legal and political interpretations. This "creative ambiguity" has enabled Consultative Parties to take important steps in the management of activities in Antarctica without prejudice to their differing legal positions. Another important example of innovation is the adoption—for the first time in an international treaty—of an ecosystem approach to the management of living resources. I will address this in greater detail later when I discuss the living resource convention.

The Antarctic Treaty has the support of the world's superpowers and of many others who wield influence on our globe. The U.S. and the U.S.S.R. have both been members since the Treaty's inception. All five members of the United Nations (U.N.) Security Council are parties to the Treaty, as are such leaders of the less developed countries as India and Brazil. In all, there are 16 Consultative Parties and an additional 16 nations which are party to the Treaty. Seven of these nations assert territorial claims in Antarctica, while the remainder neither assert claims nor recognize those asserted by others. The U.S. and the U.S.S.R., however, maintain the "basis" of territorial claims.

My purpose in making these introductory remarks about the Antarctic Treaty System is to draw attention to the fact that to date it has been a successful international instrument. The reasons for this include its flexibility, the support of the major powers, support from those holding widely divergent and even opposite political viewpoints and the leavening influence of scientific knowledge and personal relationships.

One might think that a political system with these attributes would be in relatively good shape. In fact, it is being put to the severest test since its inception. This test has two separate but related parts. Ironically, both parts of the challenge to the ATS relate directly to its past and current strengths—i.e. the breadth of political consensus and the flexibility in dealing with the changing nature of human activity.

The first challenge began in 1983 when, at the behest of Malaysia, the Non-Aligned Countries adopted a resolution calling for a U.N. study on the subject of Antarctica. A debate on this issue took place last November and, while the initial outcome—a study by the U.N. Secretary General—seems benign, there are indication that Malaysia and others will continue to press for a radical restructuring of the Antarctic Treaty System.

The second challenge to the ATS is, to some extent, an artifact of its success. The Flexibility of the system has allowed it to respond to changing circumstances over time. As the possibility or reality of new activities arose, the Consultative Parties agreed on rules to govern these activities. Many of these rules take the form of recommendations and as such can be modified by the Consultative Parties themselves. Some rules, however, take the form of separate conventions—e.g. CCAMLR and the Sealing Convention. CCAMLR has its own decision-making body and a commission to make decision about sealing could be established by the Consultative Parties if the need arose. The Consultative Parties are now negotiating a regime to govern mineral activities. It is likely that another decision-making system will emerge in this process. The Consultative Parties are faced with the problem of assuring that decisions taken in each of these bodies are consistent.

There are several ways by which consistency can be accomplished short of creating a single decision-making regime as is advocated by certain environmental groups and some in the U.N. First, we can continue to rely on the tradition of impartial scientific advice provided initially by those involved in the IGY and now by SCAR. Second, we can foster the institutional relationships between SCAR, the CCAMLR scientific advisory committee and other scientific groups dealing with Antarctica. Third, we can promote public access to scientific advice and decisions within the various regimes. Fourth, we can strengthen the decision-making processes of each regime procedures which requires consideration of other activities and decisions. We can do all these things to make sure that, as activities in Antarctica increase and become more complex, the Antarctic Treaty system continues to function as a system.

I have already mentioned the importance of CCAMLR as a creative response to an emerging Antarctic activity-fishing. CCAMLR is important in this regard because it demonstrates the ability of the Antarctic Treaty System to deal with new problems. It is also important because of the incorporation of the ecosystem approach to marine living resource management. CCAMLR has another importance. We must demonstrate to the rest of the world that it works. The implementation of CCAMLR is just as much a test for the Antarctic Treaty System as was its adoption. More nations await the results of this test due to the attention being paid to the continent in the United Nations.

The parties to CCAMLR have a good record in implementing the Convention. CCAMLR entered into force on April 7, 1982. There have been three meetings of the Commission and Scientific Committee since then. Rules of Procedure for the Commission and Scientific Committee have been adopted and financial and staff regulations were agreed to, as were budgets for 1982–1985. In addition, the Commission appointed a Secretary General and hired a Chief Scientist and Data Manager. An *interim* headquarters agreement was concluded by the Commission with the Government of Australia. At the third meeting, which concluded in Hobart, Tasmania, Australia on September 14, the Commission adopted conservation measures for certain finfish stocks and the Soviet Union announced a voluntary 50% reduction in krill harvest.

During the coming year, the U.S. will host a meeting on the status of ecosystem monitoring and assessment which will be attended by scientists representing parties to the Convention. In addition, the Ad Hoc Working Group on Fisheries Assessment will meet just prior to the next meeting of the Commission and Scientific committee to examine data from fishing countries. A third group was established at the Hobart meeting—the Ad Hoc Krill Research Working Group. The U.S. hopes to take a leading role in the deliberations of this new group.

The most pressing action required in the U.S. is passage of the Antarctic Marine Living Resources Convention Act which implements CCAMLR. Among other things, this bill would establish NOAA as the lead agency for development of a research program in support of the goals and purposes of the Convention. NOAA requires this authority in order to be prepared to assume the research responsibilities now being planned and conducted under SCAR sponsorship. I urge you to take the time necessary to pass this non-controversial legislation during this Congress.

Perhaps the most important thing about on-going mineral regime negotiations is that they have stimulated enough world interest in the subject of Antarctica to result in a challenge to the system. A second important aspect of these negotiations is that, as I have indicated, they raise the challenge of how to coordinate decisions about various activities in Antarctica. One important aspect of this coordination will be that associated with scientific research. NOAA stands ready to contribute the expertise it is now gaining in implementing CCAMLR as well as that associated with its Alaskan offshore environmental assessment program to integrate scientific research planning in support of an ecosystem approach to decision-making. This approach should look beyond management of multiple species of living resources to include consideration and regulation of mineral activities as well.

Before closing, I would like to discuss ongoing and planned scientific research. I will confine my remarks to NOAA's research activities.

NOAA's Air Resources Laboratory maintains a two-man station at the South Pole as one of our baseline observation stations to measure atmospheric trace elements with a potential effect on climate. These stations are formally a part of the global monitoring network of the World Meterological Organization. The South Pole station measures CO_2, ozone, chlorofluorocarbons, N_2O, several components of solar radiation, various physical properties of atmospheric aerosols and standard meteorological parameters.

As its contribution to the First International Biological Experiment (FIBEX) in 1981–82, NOAA funded a National Marine Fisheries Service (NMFS) research project using acoustic techniques to survey krill populations. The experiment was part of an international effort known as the Biological Investigations of Marine Antarctic Systems and Stocks (BIOMASS). The program is sponsored by SCAR, the Scientific Committee on Oceanic Research (SCOR) and other international organizations.

The Second Internatinal Biological Experiment-Phase-I (SIBEX), desinged to amplify the work done in FIBEX on krill abundance and distribution, was completed in

February. NOAA participated in Phase I in cooperation with researchers sponsored by the National Science Foundation. NOAA scientists from various NMFS laboratories used the *R/V Melville* and a U.S. Coast Guard icebreaker to obtain information on the relationship between krill abundance and ocean circulation features in the immediate vicinity of the ice front and to locate schools of krill. We are currently planning to participate in SIBEX-Phase II during the coming austral summer as well as participating in a longer-term program of living resource research.

This concludes my prepared remarks. I will be happy to answer any questions you might have.

Senator GORTON. Thank you, Dr. Byrne.

We will now hear from Dr. Zumberge.

STATEMENT OF DR. JAMES M. ZUMBERGE, PRESIDENT, UNIVERSITY OF SOUTHERN CALIFORNIA

Dr. ZUMBERGE. Good morning, Mr. Chairman. I am Jim Zumberge. I am the president of the University of Southern California, but I am here, I guess, because I am also President of the Scientific Committee on Antarctic Research, serving a 4-year term that began in 1982 and ends in 1986.

My testimony has been prepared in written form and I hope it will be entered into the record.

Senator GORTON. It will.

Dr. ZUMBERGE. I want to summarize a few points in the time allocated to me this morning with respect to international science in Antarctica, with special reference to the Scientific Committee on Antarctic Research, known as SCAR. In its 164 years of history, I think it would be fair to divide the science of Antarctica into two general phases.

The first, beginning in the period of discovery in 1820 until the IGY in 1957-58, was characterized mainly by exploitation of whales and seals and exploration of a geographical nature, which resulted in territorial claims. Any science that was accomplished during this period was merely a spinoff and a byproduct of those activities. Science was not generally the primary reason for going to Antarctica during this first phase of Antarctic history.

But that all changed dramatically during the IGY and has continued ever since, with science being now the dominant reason why there is an interest of so many nations in Antarctica, at least up until the present time. Scientific inquiry is being conducted in Antarctica by more than a dozen nations, and this is made possible primarily by the political stability of the continent, due entirely to the functioning of the Antarctic Treaty.

It is doubtful, in my opinion, that science would be such a dominant force in the affairs of Antarctica without the political stability brought about by the Antarctic Treaty. International science in Antarctica is therefore facilitated by the treaty, but it is totally separated from the treaty in terms of basic research and the thrust of research that goes on there.

Each country that engages in scientific research is supported by its government through grants. The funding agencies differ around the world. You have already heard that the National Science Foundation is the agency which facilitates and funds Antarctic research on behalf of the United States. In the United Kingdom it is the British Antarctic Survey, in Norway it is the Norse Polar Institute, and in the Soviet Union it is the Arctic and Antarctic Institute.

Some form of one or another of these exists in all of the participating countries. Now, each country, in order to guide its research in Antarctica, has a national committee. In this country it is the Polar Research Board of the National Academy of Sciences, but there is a counterpart in every other country dealing in Antarctic research.

The international organization that ties all of this together into a coherent facilitator and coordinator of research is SCAR. SCAR is organized under the International Council of Scientific Unions, better known as ICSU, and each member nation in SCAR has a delegate, and SCAR meets every 2 years. The next meeting is coming up at the end of this month into early October in Bremerhaven, Germany.

Right now there are 15 nations that are members of SCAR, the original 12 treaty nations plus both Germanies and Poland. And next month we will be considering the applications of India and Brazil to this group of scientific international groups.

Most of our work in SCAR is conducted in working groups and groups of specialists dealing with matters that come up. In addition to our scientific activities, we have some nonscience matters that we deal with from time to time. They are growing in number.

Since the treaty was signed, we have responses from the Treaty Nations in the form of requests to get information of a scientific nature that helps the treaty decide on matters that come before them in their consultative meetings. We are now considering a response from the United Nations as to how science is conducted in the Antarctic, and next year we will participate in yet another activity that was not part of our original charter, and that is a joint symposium with the International Union for the Conservation of Nature.

SCAR has been eminently successful in its more than 25 years of existence, and I think this is due primarily to the fact that SCAR maintains a rigorous distinction between science and international politics. We leave the politics to the consultative parties who address these matters at their meetings.

SCAR deals with scientific matters at its meetings, and I think that this rigid separation between science and politics will continue, although the boundary between the two is getting narrower all the time. But I think we are on the right track.

Thank you, Mr. Chairman.

[The statement follows:]

STATEMENT OF DR. JAMES H. ZUMBERGE

THE ROLE OF THE SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH (SCAR) IN THE CONDUCT OF RESEARCH IN ANTARCTICA

Mr. Chairman, Members of the Committee, my name is James H. Zumberge. You have invited me to make some comments on science in Antarctica. Since 1956, when I was planning my first expedition to the Ross Ice Shelf in Antarctica as part of the United States' involvement in the International Geophysical Year, I have devoted almost all of my professional life to Antarctic science.

These remarks represent my personal views and do not reflect the official position of the University of Southern California, of which I am President, nor the Scientific Committee on Antarctic Research (SCAR), which organization I serve as President for the period 1982-1986.

Since the discovery of Antarctica in 1820 until the mid-1970's, world-wide interest in this south polar continent has waxed and waned. Interest in this far-off place in the civilized world surged from time to time as explorers such as Scott and Shackelton from England, Amundson from Norway, and Byrd from the United States carried out expeditions in the early part of the twentieth century. Some of us in this room remember the thrill of hearing the first short-wave radio broadcast from Little America. Expeditions organized by these and others during the heroic age of Antarctic exploration concentrated on geographic discoveries. The boundaries between land and sea, the extent of interior isolated mountain ranges, and the extent of glacier ice cover were gradually defined. Science was a by-product of the exploratory activities of the early part of this century, but the exploits of these hardy pioneers captured the imagination of the public, nevertheless.

The picture changed dramatically, however, during the International Geophysical Year of 1957-58. Twelve nations combined their scientific talents and logistic resources to mount one of the greatest assaults on this unknown continent ever before attempted. Scientific information and understanding was the main target of this assault. To be sure, new mountain ranges were discovered, new coastlines were charted, and unknown waters were sounded. But, these geographic discoveries were incidental to the scientific discoveries that ultimately came out of the IGY. Great public interest was generated by the multi-nation effort of that unprecendented international event.

The international cooperation during the IGY in pursuit of scientific knowledge was so successful that the original twelve nations decided to continue their cooperative efforts indefinetly. To accomplish this, two things were done. First, the international committee that coordinated the scientific activities of the IGY was continued as the Scientific Committee on Antarctic Research, better known by its acronym of SCAR. Second, the twelve nations who participated in the Antarctic scientific research program forged a treaty which was ratified by the respective governments in 1961. Others testifying at this hearing will comment on the uniqueness of the Antarctic Treaty in the realm of international affairs, but I want to emphasize that the Treaty made possible the continuation of unprecedented international cooperation in Antarctic science that began in the IGY and still exists today, stronger than ever.

The mainstay of Antarctic science coordination is SCAR, a Committee organized under the International Council of Scientific Unions, or ICSU. Each of the countries who are members of SCAR have national committees for Antarctic research. In the United States, the Polar Research Board of the National Academy of Sciences fulfills this function. It advises the Division of Polar Programs of the National Science Foundation on the kinds of research that the United States should be conducting in Antarctica. The Polar Research Board is the link, through SCAR, between U.S. science in Antarctica and the other nations engaged in Antarctic research.

The purpose of SCAR is to coordinate research in Antarctica, sometimes initiate new research thrusts, respond to recommendations from the Treaty Nations, sponsor symposia and workshops, and maintain open lines of communication between the scientists of the member nations.

Most of the scientific matters of SCAR are handled in nine of ten working groups: Biology, Geodesy and Cartography, Geology, Glaciology, Human Biology and Medicine, Meteorology, Oceanography, Solid Earth Geophysics, and Upper Atmosphere Physics. The tenth working group, Logistics, is an exception to the generality that SCAR deals only in scientific matters.

When other matters arise that do not fall neatly within the purview of the working groups, groups of specialists are organized. Currently, five such groups exist: Antarctic Climate Research, Seals, Southern Ocean Ecosystems and their Living Resources, Antarctic Sea Ice, and Antarctic Environmental Implications of Possible Mineral Exploration and Exploitation.

From the beginning, SCAR has maintained a rigid distinction between science and politics. This separation remains until this day, but the line between the two has become more finely drawn, and SCAR must exercise constant vigilance to avoid matters and policies that, while they may relate to scientific activities, are the business of the consultative parties who administer the affairs of the Antarctic Treaty.

Among the non-scientific activities of SCAR are those that relate to requests from the Treaty Nations on various matters involving the scientific basis for decisions that face the Consultative Parties. The environmental consequences of mineral exploration is a prime example of how SCAR interacts with the Treaty Nations. Since 1976, SCAR has fielded a host of requests from the parties to the Treaty for information on the minerals question.

SCAR's spectrum of activities will broaden even further next week at its biennial meeting in Bremerhaven in the Federal Republic of West Germany. At that time, the SCAR Delegates will decide on what response will be given to the United Nations who are conducting a major study of Antarctica. And again in 1985, SCAR will join the International Union of the Conservation of Nature in sponsorship of a joint symposium on "The Scientific Requirements for Antarctic Conservation."

From time to time, various groups not familiar with the work of SCAR or its mission have interpreted SCAR's apolitical stance as evidence that SCAR is not supportive of the environmental protection of Antarctica, or is indifferent to conservation on the continent. Nothing is further from the truth because since the early days of their existence, both SCAR and the Consultative Parties to the Treaty have been conscious of the fragility of the Antarctic ecosystem and the need for protective measures. Indeed, in 1964, on recommendations formulated by SCAR, the Treaty Nations adopted guidelines for the conservation of Antarctic flora and fauna, and they designated a number of Specially Protected Areas. These measures became effective in 1966. They have since been expanded, and, in 1972, the consultative governments adopted SCAR's advice on another concept of Sites of Special Scientific Interest. Several sites have now been established, and SCAR is compiling an annotated Atlas of Antarctic Protected Areas and is preparing specific recommendations for new sites.

SCAR even published a small booklet to advise visitors and tourists on proper environmental behavior when in Antarctica to insure that conservation and preservation of the environment is practiced by all who enter the Treaty area. Those who would charge SCAR with indifference or negligence on conservation matters in Antarctica have no basis, in fact, for doing so.

Over the quarter century that SCAR has been in existence, it has enjoyed remarkable stability in carrying out its mission of fostering and guiding research. This work has continued unabated in spite of international events that have positioned some of its member nations in opposing stances. Neither the Cold War of the late fifties and early sixties nor the hot war over the Falkland/Malvinas Islands, nor any of the other international incidents and conflicts during this period, have had any material impact on the ongoing activities of SCAR. This has been due in no small measure to SCAR's policy of maintaining a rigid non-political posture in all that it does.

Membership in SCAR is open to any nation that establishes an ongoing scientific program in Antarctica. The original number of twelve nations (Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, United Kingdom, USSR, and USA) has grown to fifteen in recent years with the additions of Poland, and the two Germanies. Next week in Bremerhaven, SCAR will act on applications for membership from Brazil and India. In 1982, at the SCAR meetings in Leningrad, observers from Brazil, People's Republic of China, India, Italy, and the Netherlands were present, and in Bremerhaven observers from Sweden and Uruguay will be added to this group. It is not farfetched to suggest that SCAR may have twenty members by the end of this decade.

Mr. Chairman, it has been a privilege for me to be invited to add my small testimony to these hearings. If you or members of the Committee have questions related to my contribution to these hearings, I will do my best to answer them. Thank you.

Senator GORTON. Thank you, Doctor.

Ms. Lee Kimball.

STATEMENT OF LEE KIMBALL, INTERNATIONAL INSTITUTE FOR ENVIRONMENT AND DEVELOPMENT

Ms. KIMBALL. Thank you, Mr. Chairman.

My name is Lee Kimball and I am testifying today on behalf of the International Institute for Environment and Development, which for over 8 years has been involved in various Antarctic policy issues. I am not going to cover any aspects of the Marine Living Resources Convention. I prefer to leave that to my two public interest colleagues, Bill Brown and Jim Barnes.

I would like to cover two sets of issues with which IIED is particularly concerned and which concern greatly the future of Antarctica. One is the effectiveness of the present system of management for Antarctica, particularly as it covers conservation and environmental protection issues. The second is increasing international interest in Antarctica and an appropriate U.S. response.

Let me turn first to the management questions of Antarctica. The consultative parties to the Antarctica Treaty have often acknowledged that Antarctica derives much of its scientific importance from its uncontaminated and undisturbed condition. Yet the increase in recent Antarctic activities and greater interest in resources development there may undermine this emphasis on protecting the environment and preserving Antarctica as a preserve for scientific research. In particular, the advent of minerals development activities in Antarctica could significantly alter the pristine state of the continent and impact upon its value for scientific research and on living species in the area.

Last March, 11 major U.S. environmental organizations developed a set of recommendations on the minerals regime, which I have included in my testimony for your information. We stressed the importance of the principles developed in that regime as guiding criteria for any decisions taken on Antarctic minerals development. We also stressed the need for adequate information for decisionmakers as they consider minerals development questions, and the need for environmental impact assessments. We have supported increased funding for both international and national research programs in Antarctica that can provide the kinds of information that decisionmakers would require both in implementing the mineral resources regime and in implementing the other regimes, like the CCAMLR, that apply to Antarctica.

With respect to decisionmaking, we believe that the minerals regime should provide for procedures that guarantee consistent and effective application of the principles adopted in the various regimes, and we support collective judgments by a significant majority of the countries involved in decisionmaking as the best way to accomplish this sound application of principles. We also believe that the decisionmakers should rely on impartial, expert scientific and technical advice in decisionmaking, and we recommend that the individuals serving in this capability have independence and continuity in the performance of their functions. We made a number of other recommendations on the decisionmaking procedures as they apply to specific decisions in the regime as you will see in the attached document.

On the subject of inspection and compliance, the Antarctic Treaty has recently been criticized for its failure to identify procedures allowing parties to review and challenge others' proposed scientific and logistics activities in Antarctica that may have an impact on the Antarctic environment. The environmental community is particularly concerned with these aspects of monitoring, inspection, and enforcement under the Antarctic Treaty system. Even though the Antarctic Treaty inspection procedures are unique in international instruments, they are not frequently utilized by the consultative parties. I think the United States is one of the countries that most frequently utilizes inspection procedures.

In addition, when questions of compliance do arise, as in a situation I will not describe in detail but I will just refer to as the French airstrip question that I think you have seen material on, it is often hard to review the facts. Because the Antarctic Treaty is not specific about how to trigger enforcement actions, it is doubly important that the consultative parties adopt a very open attitude toward accountability for their actions and make public reports on compliance with all the Antarctic legal regimes. I would recommend that the national reporting requirements under all Antarctic Treaty regimes include reports on compliance with those regimes; that these reports be part of the public record; and that they cover inspections, questions raised, and follow-up enforcement actions. I would also recommend that the inspections explicitly cover potential and actual environmental damages in Antarctica, and that technical personnel qualified to assess these damages be included in the inspection tours.

On the question of environmental impact assessment, the consultative parties at their last meeting decided to further consider environmental impact assessment procedures for logistics and scientific activities. IIED is contributing to the process of identifying and trying to improve upon these impact assessment procedures.

Finally, the public interest organizations have all recommended that the review and comment role of international and nongovernmental observers in the Antarctic Treaty system be expanded. It seems to me that this combination of measures—the more ample national reporting requirements, improving on inspection procedures, improving on the environmental impact assessments, and the review and comment role—may contribute significantly to greater accountability of the Antarctic treaty system. This would reassure those who are not involved with the system that noncompliance will not go unnoticed, and reassure the wider international community that it will be alerted about possible ramifications affecting them.

One final point having to do with the existing state of Antarctic management. The increase of activities in Antarctica also leads to concerns about cumulative impacts of these activities. This will require greater coordination among the scientific advisory and the decisionmaking institutions within the Antarctic Treaty system. I noted John Byrne's comments on this and support them. Better coordination will also help to ensure the consistent application of standards among Antarctic regimes and that data and information relevant to decisionmaking in the different forums are communicated among them.

One of the difficulties in trying to effect this coordination among the regimes is that there is no permanent body or secretariat under the Antarctic Treaty itself. The practice of headquartering the different legal instruments and institutions in different countries also makes coordination difficult. I think this issue of coordination—how to improve it—deserves further consideration.

Turning to the increasing international interest in Antarctica, I do believe that the treaty system is a singularly effective and workable international system and it is well worth exploring adjustments that can guarantee its international acceptability and longevity. I have attached a brief IIED summary of a debate that took place at the United Nations last fall. In summary, the kinds of points that were raised by countries not party to the treaty system are that the system is too secretive and that it has too limited a decisionmaking base. They advocate greater accountability on the part of the system, wider international cooperation, a broader international decisionmaking base, and equitable sharing of benefits from any mineral resources regime.

These criticisms to me point to several adjustments that could improve the operation of the treaty system and thus enhance its worldwide acceptability. One is making more easily available information on the system. Oversight hearings of this sort are a good forum to make information public.

I am also encouraged by a number of recent steps that have been taken by the consultative parties to make information more available, to consider how to further increase the information flow, and to bring outside observers into the system.

However, I would recommend in addition, as I noted before, that the public record on Antarctic matters include all reports on inspection, enforcement, and national implementation of the legal instruments in the system. This will help provide the interested public with basic information to evaluate for themselves whether or not the system is being effectively applied and enforced.

I also see no reason why the basic chairman's reports and texts that summarize the state of progress in the minerals negotiations should not be made available to interested parties. This is particularly important in the context of the mineral negotiations because of the kind of international attention this negotiation in particular has brought to Antarctic affairs.

On participation, international and nongovernmental organizations' observers are already taking part in the institutions of the CCAMLR, as you have heard from other witnesses today. The role of observers is a particularly valuable channel for both public and international accountability on Antarctic matters. Developing closer working relationships between the Antarctic Treaty system and these organizations can also provide a viable means of broadening the base of the Antarctic decisionmaking without actually creating new global institutions and without making radical changes in the treaty system as it currently operates.

I would recommend that this practice of inviting observers be extended to the biennial consultative party meetings and to all treaty system meetings and forums. This would allow observers to receive notifications documentation and the right to comment on matters under discussion. It is my understanding that this is working out quite effectively in the CCAMLR context, where some observers now take part in meetings. In addition, I think it is worth considering how to develop a process that publicizes pending decisions prior to their final approval to permit review by interested individuals and organizations.

Another important benefit of developing close working relationships between the treaty system and international and nongovernmental organizations is that this can facilitate identification of collaborative international scientific research projects. These would both serve the purposes of the treaty and could make additional countries possibly eligible for decisionmaking within the terms of the treaty system. This helps widen international cooperation and helps broaden the base of decisionmaking, addressing are two of the major criticisms that have been leveled at the treaty system from countries outside. It does so while retaining the basic requirement that participation in decisionmaking in the system be based on experience and expertise in Antarctic affairs. Similarly, opportunities for joint efforts could be expanded in national scientific programs and in any minerals development projects that might be approved.

So in summary, Mr. Chairman, the management system in Antarctica is facing new strains as increasing activities there and the possibilities of minerals development may impinge on Antarctica's value for scientific research and in preserving the environment and conserving species there. But I do not think the problems are insurmountable and I have recommended several improvements in this system.

On the international front, there are also adjustments that could meet outside criticisms, that could respond to the call for wider international cooperation and broadening the base of decisionmaking without fundamentally altering or disrupting the existing system of governance in Antarctica.

The initiatives I have suggested I think will invoke support from the vast majority of countries outside the system, which at the moment have no incentive to support it. This would avoid a confrontation over Antarctica and demonstrate once again the responsiveness and adaptability of the system and preserve the peace and stability that have reigned there for over two decades.

Thank you.

[The statement follows:]

STATEMENT OF LEE KIMBALL OF THE INTERNATIONAL INSTITUTE FOR ENVIRONMENT AND DEVELOPMENT

Mr. Chairman and members of the subcommittee, my name is Lee Kimball.[1] I serve as a consultant to the International Institute for Environment and Development (IIED) on Antarctic policy matters. IIED is a non-profit, non-governmental organization with offices in Washington, D.C., London, United Kingdom, and Buenos Aires, Argentina. We have been involved in Antarctic issues for over eight years.

My own role is to follow general policy developments under the Antarctic Treaty and in the minerals regime negotiations, as well as the broader issues and questions recently raised about the Antarctic Treaty System in wider international forums. I will leave discussion of Antarctic marine living resources to the other representatives of the public interest community testifying today.

The Antarctic Treaty System (ATS) is now composed of the 1959 Antarctic Treaty, the 1972 Convention for the Conservation of Antarctic Seals, the 1980 Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), and the non-governmental Scientific Committee on Antarctic Research (SCAR), a component of the International Council of Scientific Unions (LCSU). The Polar Research Board of the National Academy of Sciences is the U.S. arm of SCAR. The ATS also encompasses all the recommendations approved by the Antarctic Treaty Consultative Parties (ATCPs) at their regular, biennial meetings on such varied subjects as logistics, telecommunications, tourism, the exchange of scientific data and protection and conservation of Antarctica and its living species. In the not too distant future, a regime governing the possibility of mineral resources development in Antarctica will probably be added to the ATS.

For over 20 years the 1959 Antarcitc Treaty has provided the framework through which to address the management of Antarctica and has proven adept at responding to new issues and changing circumstances as they arise. It has guaranteed peace and stability in the area south of 60 degrees South latitude, demilitarized and denuclearized Antarctica and established a unique system of international inspection that provides for "freedom of access at any time to any or all areas of Antarctica". In addition, "aerial observation may be carried out at any time over any or all areas of Antarctica."

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[1] Lee Kimball has served as an adviser on the State Department's Antarctic Advisory Committee since 1979 and since 1980 has been a non-governmental member of U.S. delegations to Antarctic Treaty meetings and the special negotiations to conclude a regime for Antarctic minerals.

The use of Antarctica for peaceful purposes only is the first major objective of the ATS; its other aim is to promote international collaboration in scientific research there. In fact, the negotiation of the 1959 Antarctic Treaty focused on scientific research as the vehicle to obtain agreement on the rest of the treaty, in particular article IV addressing the positions of claimant and non-claimant states parties.

The Antarctic Treaty today is at a crossroads. Growing interest in resources development in Antarctica gives rise to concern that this will mar the effectiveness of the existing management system in carrying out its stewardship role of protecting the Antarctic environment and living species there. At the same time, countries that are not party to the 1959 treaty have begun to raise questions about the exclusivity of the ATS and its lack of accountability to the wider international community affected by developments in Antarctica. They have questioned the self-appointed role of the ATCPs—those countries with decision-making status under the Antarctic Treaty—in managing Antarctica and have called for wider international cooperation in Antarctica.

In both cases, the commencement of the special series of ATCP meetings to negotiate a regime to govern the possibility of mineral resources development in Antarctica has been the stimulus to heightened interest in Antarctica. In both cases, the credibility of the ATS is under attack because those questioning the system believe that they do not have access to complete information on Antarctica Treaty proceedings and activities in Antarctica.

I have attached an Antarctica timeline to my testimony as a convenient reference to recent development affecting Antarctica. It commences with the adoption at the XIth biennial ATCP meeting in 1981 of Recommendation XI-1, which provides the basis for the minerals regime negotiations, and takes note of new accessions to the Antarctica Treaty, the achievement of consultative party status by Brazil and India, Antarctica Treaty and related meetings and developments at the United Nations.

In my testimony today, I will concentrate on two sets of issues affecting the future of Antarctica that are of particular concern to IIED;

(1) The effectiveness of the existing management system for Antarctica, particularly in protecting the Antarctic environment and conserving living species there; and

(2) Growing international interest in the system of governance for Antarctica and an appropriate U.S. response. I will summarize some of the recent criticisms leveled at the ATS and recommend approaches that in my view would address these criticisms at a practical level and improve the operation of the ATS.

Recent development of the United Nations and the positions taken by countries outside the ATS represent the greatest single challenge to the system. It is clear that the moment Antarctica becomes a bone of contention in international circles, the Antarctic Treaty will lose is effectiveness in maintaining peace and stability at the South Pole, in promoting international cooperation in science, and in protecting the Antarctic environment and conserving its living species. I don't believe that outside criticisms are going to wither and die in the face of ATCP opposition. For this reason, it behhooves the United States and the other ATCPs to seize the initiative and seriously consider adjustments in the ATS that can make it more palatable to the wider international community. They have already begun this process, and I will suggest additional steps they could take that gradually build upon the ATS. If the ATCPs wish to obtain broader support for the ATS, they will have to provide incentives for additional nations to adhere to the treaty.

Equally important, the existing system of governance in Antarctica has proven a uniquely valuable model for peacekeeping and international consultation. If it can maintain its flexible and dynamic character, responding adequately to today's challenges, the result will be all the more compelling as a model for global problem-solving. The alternative is that Antarctica will polarize attitudes in the United Nations and elsewhere, leading to proposals for far more radical change in the system of governance there and potential confrontation with the ATCPs.

THE MANAGEMENT OF ANTARCTICA

Let me turn first to the effectiveness of the existing international system of management for Antarctica. Antarctica Treaty provisions call for continuing consultations on measures in furtherance of the principles and objectives of the treaty, including "the preservation and conservation of living resources in Antarctica". Over 130 recommendations have been adopted by the ATCPs as a result of these consultations. In 1970, the ATCPs first acknowledged in Recommendation VI-4 that "the Antarctic derives much of its scientific importance from its uncontaminated and undisturbed condition," and that "there is an increasingly urgent need to protect the environment from human interference." Numerous subsequent recommendations have stressed the importance of protecting the Antarctic environment and associated ecosystems and linked this to Antarctica's value for research on global processes.

Yet the increase in Antarctic activities and the recent interest in resources there may undermine these emphases. One criticism of the ATS targets the decision-making procedures in the 1980 CCAMLR that require consensus for the adoption of conservation measures, and in addition allow any member of the Commission to object to conservation measures adopted. Another relates to the failure of the Antarctic Treaty to identify procedures allowing treaty parties to review and challenge others' logistics and scientific activites potentially damaging to the Antarctic environment and ecosystems. Whether the French government did not adequately review the construction of an airstrip at Terre Adelie in Antarctica for potential environmental effects, as charged by some critics, is a moot point. What is clear is that sufficient doubt remained in the minds of some scientists and environmentalists about the project's potentially damaging effects, yet they had no mechanism or forum they could easily turn to to express their doubts, have them considered in a timely fashion and, if deemed valid, acted upon. Their only recourse was the press and the power of public opinion. I will return to this issue of environmental review, inspection and enforcement in my comments on the minerals regime.

The Antarctic mineral resources negotiations have particularly concerned the environmental community worldwide. The advent of minerals development activities in Antarctica would significantly alter the continent's pristine nature and its value for scientific research as well as impact on living species in the area. Last March, eleven major U.S. environmental organizations agreed on a set of recommendations regarding the Antarctic minerals regime negotiations. I have attached these to my testimony for your information. In considering them, it should be borne in mind that the minerals negotiations will not produce a detailed set of rules. They will complete a framework regime, which will specify basic principles and standards in accordance with which all minerals activities will have to be conducted, and provide for institutions and decision-making procedures to implement and apply these principles and to elaborate more detailed regulations if and when mineral resources development in Antarctica becomes feasible and acceptable. Thus the princples and standards and the decision-making procedures adopted are critical to effective environmental protection under the future minerals regime.

Principles: Information

For instance, with respect to principles, one of our major concerns as environmental organizations is that decisions to allow minerals activities to proceed be taken only once sufficient information exists to adequately evaluate potentially damaging effects. We recommend that no mineral resources activity be allowed to proceed until an environmental impact assessment has been completed and the appropriate institutions of the regime have determined that available information is sufficient to conclude that the activity in question will not cause various specified environmental impacts. We would like to see the information requirements actually spelled out in the regime or in an annex thereto.

In addition, we support increased funding for both national and international research programs that can provide the types of information required by decision-makers to give effect to the principles and standards prescribed under all Antarctic regimes. In the minerals regime, this would include data on the Antarctic environment and its associated ecosystems; on potential impacts of logistics and resources activities; on environmental hazards like ice and weather conditions that could endanger operations and cause more widespread disruption of Antarctic ecosystem; and on the nature of effectiveness of equipment and operational procedures in Antarctica.

Decisionmaking

In addition to providing strict principles or standards directly applicable to all decisions taken under the regime, we believe that the minerals regime must provide for decision-making procedures that guarantee the consistent and effective application of these principles. We recommend that a collective judgment by a significant majority of the countries involved in Antarctic decision-making is the best way to ensure sound application of the principles and a balance between the 'pro-development' and 'conservation-minded' states among the decision-makers. We support reliance on expert scientific and technical advice in the decisionmaking process and recommend that individuals serving in this capacity be assured independence and continuity in the performance of their functions.

We also recommend that the regime be flexible enough to allow for review and modification of measures adopted under it as additional scientific and resources data as well as information on new and improved technologies becomes available. It is very likely that in the initial stages of mineral resources activities in Antarctica, the experience acquired and the activities themselves will substantially increase knowledge of the area and of potential impacts of mineral resources activities. This should be taken into account in the regulatory framework.

We are particularly concerned with decision-making at two points in the mineral resources regime: the 'threshhold' decision, when the overall acceptability of mineral resources activity in a given section of Antarctica will be determined, and the decision to proceed from prospecting and exploration to full-scale commercial development activities. We recommend that the threshold decision be taken by consensus, based on sufficient information, and that the decision to proceed to commercial development be reviewed by all parties involved in decisionmaking and approved by a substantial percentage of the parties to the regime.

Finally, we support provision for a review of prospecting activites should four or more parties to the regime so request, to determine whether the prospecting activity in question is in conformity with measures adopted pursuant to the Antarctic Treaty for protection of the environment and with the principles of the minerals regime itself and any relevant measures adopted pursuant to it.

Inspection, Compliance

Provision for monitoring, inspection and enforcement under all Antarctic Treaty regimes is another major concern of the environmental community. The Antarctic Treaty inspection procedures are unique in international instruments. Nevertheless, they are not frequently utilized by the ATCPS. On the one hand, this demonstrates the confidence of the ATCPs that they are all complying with Antarctic regimes (and attests to the costs of conducting inspections). On the other hand, when questions of compliance do arise, it is not always easy to review the facts, as with the french airstrip case. Moreover, the opposing views held by parties to the Antarctic Treaty on the territorial states of Antarctica lead to ambiguity when it comes to specifying how to trigger an enforcement action. Antarctica's ambiguous territorial status makes it unlikely that legal instruments within the system will formalize precise procedures for enforcement actions. For this reason, it is doubly important that the ATCPs adopt a very open attitude toward accountability for their actions and make public reports on compliance with Antarctic legal regimes.

I would recommend that national reporting requirements under the ATS include reports on compliance with all Antarctice Treaty regimes, and that these be published as part of the public record, along with reports on inspections questions raised, and follow-up enforcement actions. I would also recommend that the Antarctic Treaty inspections explicity cover potential and actual environmental damages in Antarctica and that technical personnel qualified to assess these damages be included on all inspection tours. Whether and how to ensure more frequent and perhaps more focused inspection tours merits further consideration.

I believe that the steps taken in Recommendation XII-3 adopted at the ATCP meeting last year, calling for further consideration of environmental impact assessment procedures for scientific and logistics activities in Antarctica will contribute to improved review of proposed activities of this sort. IIED has commented on the proposals of the U.S. Polar Research Board on this subject, which will be considered by SCAR in the near future.

In addition to more ample national reporting requirements, improving upon the Antarctic inspection system and promoting environmental impact assessment of proposed scientific and logistics activities, public interest organizations have advocated that the review and comment role of international and non-governmental organization observers in the ATS be expanded. I will discuss how this could be done in the section of my testimony dealing with increasing international interest in Antarctica. I believe that this combination of measures would contribute significantly to the great accountability of the ATS. It would reassure those not involved with the system that non-compliance with Antarctic Treaty regimes will not go unnoticed and thus that the wider international community will be alerted about possible ramifications affecting them.

Cumulative Impacts, Integration, and Coordination of the ATS

As the ATS expands to encompass potential mineral resources activities, this gives rise to concerns about the cumulative impacts of a variety of activities in Antarctica and the need for integration and coordination of the ATS. As more countries undertake Antarctic scientific activities, the number of bases and transport activites will increase. As long as the ticket to Antarctic decision-making remains something on the order of the establishment of a scientific station or the dispatch of a scientific expedition to Antarctica, we can expect additional strains on the Antarctic environment and its pristine value as more countries seek to meet this qualification. Growing tourism and fishing efforts will increase congestion and the potential for accidents in the area. But there is no doubt that the onslaught of Antarctic minerals development and supporting operations would add a whole new dimension to the possibility of accidents and cumulative environmental impacts in Antarctica.

For this reason, the environmental community has recommended that the criterion of cumulative impacts of Antarctic activities and their effects on the value of Anta~~rctica as~~ a scientific research preserve should be critical standards in determining whether or under what conditions to pursue additional activities in Antarctica.

For this reason, the environmental community has recommended that the criterion of cumulative impacts of Antarctic activites and their effects on the value of Antarctica as a scientific research preserve should be critical standards in determining whether or under what conditions to pursue additional activites in Antarctica.

We also wish to ensure that the expansion of activities in Antarctica does not impinge on those areas deemed of special scientific, historical, ecological, environmental or aesthetic significance, nor adversely affect unique biological communities identified under any Antarctic Treaty regime. We believe it will be important, particularly under the minerals regime, to set aside certain areas as 'control areas' to facilitate study of the impacts of activities elsewhere, and we would like to see these protected areas designated prior to approval of any minerals activities.

This will require coordination among the ATS advisory and decision-making institutions. They will have to ensure that standards are consistently applied among the various regimes and that data and information relevant to decision-making is communicated among them. This could be addressed by providing for observer participation by secretariat staff from one regime in meetings of the other regimes. However, the absence of any permanent institutional structure under the 1959 treaty is a problem in this regard. Nor does the practice of depositing and/or headquartering the different legal instruments and institutions of the system in different countries enhance coordination among them. How to accomplish this coordination deserves further consideration.

INCREASING INTERNATIONAL INTEREST IN ANTARCTICA

Turning now to an appropriate U.S. response to growing international interest in Antarctica, I noted earlier that the credibility or accountability problem is one that spans both the environmental concerns and those raised by a number of foreign countries. Since I believe that the ATS is a singularly effective and workable international system, I believe it is well worth exploring adjustments in the system that could guarantee its international acceptability and thus its longevity. Only shortsightedness will prevent the ATCPs from building on their recent efforts to open up the ATS by further increasing the information flow on Antarctic matters and by expanding participation in Antarctic meetings.

It is unfortunate that when the ATCPs adopted Recommendation XI-1, they called for the conclusion of a minerals regime "as a matter of urgency", for this left the impression with non-ATCP countries that the ATCPs were about to appropriate vast minerals wealth for their own benefit. These countries began to challenge the self-appointed right of the small number of ATCPs to manage Antarctica and raised questions about the territorial status of Antarctica and resources ownership there, bearing in mind the application of the common heritage of mankind concept to seabed minerals beyond national jurisdiction.

The rest is history, with the entry of the United Nations into the Antarctica debate last year and reconsideration of the Antarctic agenda item this fall in the General Assembly, with a possible call for the establishment of the special United Nations committee on Antarctica. I have attached a brief IIED report summarizing U.N. debate on the Antarctica agenda item last fall. In sum, countries not party to the ATS are critical of its secrecy and its limited decision-making base. They advocate greater accountability on the part of those managing Antarctica, wider international cooperation in Antarctica, broadening the base of Antarctic decision-making and equitable sharing of benefits from Antarctic minerals development.

Information

These criticisms point to several adjustments that could improve the operation of the ATS and thus enhance its acceptable worldwide. First, as Antarctica becomes more visible, it is important that information about the area, its resources and the system of governance there be made easily available to all those interested in the subject. Accurate information will give policymakers and the public alike a sound basis for their views and decisions regarding Antarctica and help to meet the legitimate need for national and international accountability on the operation of the ATS and activities in Antarctica.

Oversight hearings such as this one are an important forum through which to evaluate and publicize Antarctic developments. The non-governmental community also values the commitment of the U.S. government to involve non-governmental organization representatives in advisory bodies and negotiations related to Antarctica.

I am encouraged by the recent steps by the ATCPs at their XII biennial meeting in 1983 to increase the availability of their reports and of background material on the ATS; to explore additional means to facilitate public access to information and documentation on Antarctic meetings and activities; to invite representatives of international and non-governmental organizations to participate in meetings of the institutions established by the CCAMLR and to make publicly available all reports and conservation measures from that regime; and to invite representatives of the 16 countries that have acceded to the Antarctic Treaty to participate as observers in the biennial ATCP meetings and in the special series of meetings to negotiate a mineral resources regime.

I also support the recent decisions of the governments of Australia and New Zealand to include representatives of non-governmental, public interest organizations in their own national delegations to Antarctica Treaty meetings and would like to see this practice adopted by additional states party to the Antarctic Treaty.

In addition, as noted above, I would like to recommend that the public record on Antarctic matters include all reports on inspection, enforcement and national implementation of the legal instruments that comprise the ATS. This will help provide the interested public with the basic information to evaluate for themselves whether or not the ATS is being effectively applied and enforced. In the recommendations compiled by the 11 U.S. environmental organizations last March, we detailed the categories of information we would support including in the public record.

Recommendation XII–6 also provides that information documents considered at each biennial ATCP meeting may be made publicly available if no consultative party objects. This is a step forward, as is the unusually detailed report of the XII ATCP meeting. However, while I recognize that negotiations in progress require a certain amount of secrecy with respect to national positions, I see no reason why the basic chairman's reports and texts that summarize the state of progress in the minerals negotiations shouldn't be made publicly available. This is standard international organization practice and tends to improve the quality and focus of outside comments on substantive matters. No harm seems to have followed the "leaking" of the first chairman's report; to the contrary, it produced some constructive feedback.

In this context, I would stress that because it is the minerals regime negotiations that have focused international attention on Antarctica, and because there is no definitive answer to the question of who owns Antarctic mineral resources, it is all the more important for the ATCPs to account to the international community for how they plan to devise a widely acceptable minerals regime. The ATCPs do not intend to resolve minerals ownership in the regime, and as a group they do not claim to own Antarctic minerals; they will build the Antarctic minerals regime on the same ambiguous legal basis that underlies the rest of the ATS. They need to gain support for that outcome.

Finally, as the depositary government for the 1959 Antarctic Treaty, the U.S. is called upon in Recommendation XII–6 "to examine the question of information about the ATS, including publicly available documents arising from Consultative Meetings, with a view to identifying and cataloguing publicly available information about the System and identifying the sources from which such information can be obtained." Some of us will be working with the U.S. government on proposals to achieve this goal, and look forward to the support of the Congress in facilitating this public oversight opportunity.

Participation

As I noted earlier, international and non-governmental organization observers are already taking part in the meetings of the institutions established by the CCAMLR. Participation as observers in the Antarctic Treaty meetings and the minerals regime negotiations by countries that have acceded to the Antarctic Treaty is another fairly recent development.

The role of observers, in my view, provides a particularly valuable channel for greater public and international accountability on Antarctic matters. Developing close working relationships between the ATS and relevant international and non-governmental organizations having a scientific or technical interest in Antarctica can also provide a viable means of broadening the base of Antarctic decision-making without creating a new global institution.

I recommend that the practice of inviting international organization and non-governmental organization observers be expanded to include participation by representatives of relevant organizations in biennial ATCP meetings as provided for in the report of the XII ATACP meeting. This option has long been available under article III of the Antarctic Treaty. Possible candidates include represenatives of the United Nations itself as well as of the United Nations Environment Program (UNEP), the Intergovernmental Oceanographic Commission (IOC), the International Telecommunications Union (ITU), the World Meteorological Organization (WMO), the International Union for the Conservation of Nature and Natural Resources (IUCN) and various committees of the ICSU.

Not only would more extensive observer participation contribute technical expertise to these forums, it would also provide two-way channels for information and comment on Antarctic matters between the ATS and the larger-membership organizations. In the comments submitted by the 11 U.S. environmental organizations attached, we advocated that observers be invited to participate in the meetings of the institutions established by the minerals regime and receive notifications, documentation and the right to comment on pending decisions under the Antarctic minerals regime. As I understand it, this is in effect the practice that is evolving in the CCAMLR institutions, because inviting observers to participate in meetings and institutions allows them to receive documentation in a timely fashion and to take part in discussions. I would support extending this practice to all Antarctic meetings and institutions.

In addition, it is worth considering how to develop a process that publicizes pending decisions prior to final approval to permit review by interested individuals and organizations. Each national government could be responsible for publication, for the U.S., say in the Federal Register, and comments could be forwarded directly to the relevant institutions of the ATS within a specified time period. Or they could be transmitted to national representatives for consideration in national policy determinations. All relevant comments would be required to be given serious consideration by the recipients.

Another benefit of developing close working relationships between the ATS and various international and non-governmental organizations is that this could facilitate the identification and pursuit of collaborative international scientific research programs. These could serve both the purposes of the ATS and of furthering world scientific knowledge. They could also provide an opportunity for interested and qualified scientists from developing countries to participate in Antarctic research programs even though their own national governments had determined that a domestic Antarctic research program was not a top priority. Over time, participation in joint research projects may make additional countries eligible to take part in Antarctic decision-making (and could also reduce environmental impacts caused by each country establishing its own station or launching its own national expedition in order to become eligible to take part in Antarctic decision-making.) This would address developing countries' concerns with widening international cooperation in Antarctica and broadening the base of Antarctic decision-making, while retaining the basic requirements of the ATS that participation in decision-making should derive from actual experience and expertise in Antarctica affairs.

Similarly, the ATCPs could make a determined effort to expand opportunities for foreign nationals interested in Antarctic science to participate in their national research programs. The U.S. has a good record in this area, as do several other ATCPs. For those countries expressly interested in taking part in Antarctic science, this presents a well-worn path to eligibility for Antarctic decision-making. Acceding states to the Antarctic Treaty have taken part in ATCP research programs both before joining the treaty and as a means to expedite the development of their own national programs so as to qualify for consultative status.

With respect to mineral resources development activities, the Antarctic minerals regime should provide for the possibility of joint ventures that could broaden international participation in these activities.

Conclusion

In summary, Mr. Chairman, the management system for Antarctica is facing new strains as increasing activities there and the possibility of minerals development may impinge on Antarctica's value for scientific research and the emphasis on protecting the Antarctic environment and conserving living species there. Nevertheless, the problems are not insurmountable.

Ensuring that decision-makers can rely on ample information will require commitments to fund research programs.

Designing effective coordination mechanisms within the ATS must be explored to guarantee that standards and principles are consistently interpreted and applied and that cumulative impacts are taken account of.

Pressures to develop resources in the region must not be allowed to undermine either the implementation of the standards agreed to in CCAMLR or the importance of devising stringent standards and and sound decision-making procedures in the negotiation of a minerals regime.

On the international front, the ATCPs will have to respond to criticisms if they wish to avoid a call for major institutional change. But there are adjustments which could meet outside criticisms of the lack of accountability and the secrecy of the ATS. They could also respond to the call for wider international cooperation in Antarctica and a broader base for decision-making without fundamentally altering or disrupting the existing system of governance in Antarctica:

The ATCPs will have to not only ensure compliance with the Antarctic regimes they have agreed to, and improve upon the procedures to identify activities potentially damaging to the purposes of the Antarctic Treaty—through the inspection system, more ample reporting requirements and current efforts to elaborate provisions on environmental impact assessments for stations and logistics activities—*they will also have to demonstrate to the outside world that they are doing so.*

They can make additional improvements in the information policies in order to deepen knowledge and understanding of Antarctic affairs.

They can expand observer participation and develop closer working relationships with international and non-governmental organizations.

They can promote collaborative research and joint development programs that involve a wider spectrum of the international community, which could make additional countries eligible for decision-making status in the system.

These initiatives, in my view, will invoke support from the vast majority of countries outside the ATS that at the moment have no incentive to support the system. This would avoid a confrontation over Antarctica, demonstrate once again the responsiveness and adaptability of the ATS and preserve the peace and stability that has reigned there for over two decades.

Senator GORTON. Thank you, Ms. Kimball.

Mr. Barnes.

STATEMENT OF JIM BARNES ON BEHALF OF THE ANTARCTIC PROJECT

Mr. BARNES. Thank you, Mr. Chairman.

I am pleased to testify this morning on behalf of 16 environmental organizations, which are listed on the front of my testimony. We really appreciate your convening these oversight hearings. We think they are a very useful forum for raising various concerns and making suggestions that, as Lee was just stating, could improve the Antarctic Treaty system and make it more acceptable to the entire international community, which is a goal that we all share.

Although Antarctica is very far away and political developments concerning its future are rarely reported in the United States, we believe that the United States has a critical role to play in determining what that future is. The nature of U.S. leadership in implementation of CCAMLR, as we have heard this morning, I think has been absolutely imperative to its successful implementation and functioning.

We need that leadership in every aspect of the Antarctic Treaty system and also at the United Nations, I think, in order to work out a viable solution to the future of Antarctica.

This region in our view is probably going to be the best monitoring zone for global pollution in the future. It quite likely will be the last place on Earth where enormous populations of wildlife are allowed to breed, feed and migrate according to the natural order of life. In short, we feel that it will probably be the last great wildlife sanctuary on the face of the Earth in another 30 or 40 years.

In that context, our organizations believe that the best use of Antarctica, taking into account the long-term view and the interests of the entire world community, is as a wildlife sanctuary, science preserve, and a zone of peace. This is sometimes referred to by our member groups as the "full protection" option, and it goes by different words: World park, world preserve, and so forth.

In our view, these are exactly the values protected by the original principles of the Antarctic Treaty, which does not mention resources. We do not see the governments involved being willing at this time to consider seriously the "full protection" option.

All the organizations represented in this statement support the need for a long-term moratorium on any minerals development until the best future use of the Antarctic has been studied carefully. Some of the groups take the further step of calling now for Antarctica to be protected as a world park and preserve, as I mentioned.

We believe the Antarctic Treaty is an admirable instrument. It contains many provisions that probably could not be negotiated in today's political and diplomatic climate. Its principles regarding demilitarization, scientific research and respect for the environment are excellent. We do suggest, however, that improvements would be desirable, and in that context we endorse the comments that Ms. Kimball has just made.

I wanted particularly this morning to mention a couple of other suggestions that we have been making for the last year. The first is for an Antarctic Environmental Protection Agency to be established. I will not go into all the details of this because it is in my statement, but basically we see this as being a valuable addition to the Antarctic Treaty system, and it would be a device which takes away from any individual nation-state total power to interpret the rules, enforce the rules, and so forth.

We have laid out the factual background of the French airstrip controversy as we understand it in our prepared statement, and it is one that very greatly concerns not just our group of organizations, but scientists all over the world. It is our understanding that hundreds of individual scientists and institutions around the world have written the French Government about the building of this particular airstrip in one of the three or four major bird habitats of the Antarctic. At one point, about 6 months ago, France was induced to set up a scientific committee to look into this question. It was allegedly international.

It was international in the sense that it included one British and one American scientist. The committee met in March and heard about 50 witnesses in various ways, both orally and in writing. The committee unanimously recommended against the project, and also unanimously recommended that a new impact study be prepared.

Well, France has done a study, although it has only been released for comment in France and then for only about 3 weeks, but they are forging ahead with the project. In our view there is just no mechanism in the Antarctic Treaty system at the present time for cooperatively using the consultative process to analyze the environmental impacts of projects in advance or for studying alternatives, and for stopping a project if it looks like it is not in the best interests of the overall system or if it violates the Agreed Measures.

Turning briefly to the CCAMLR—and I have a lot of detailed comments in the prepared statement—we have been calling for the last 2 or 3 years for whale habitat sanctuaries to be created in the southern ocean. In our view, this would be a measure which would complement the recent moratorium in the IWC which is due to go into effect next year. As you, the monotorium stops the direct killing of whales.

For a lot of reasons, scientists that are advising our organizations believe there is direct competition between the krill fishery and the recovery of these endangered whale species, especially if the krill fishery is concentrated the way that it has been, in a couple of areas. The level of fishing has fallen in the last year to a level where right now we are not quite so concerned.

If the harvest is a quarter of a million tons a year of krill, that does not concern us. But for a while it was increasing rather dramatically every year, and we thought at one point it was going to be shooting up toward 1 million tons, heavily concentrated.

Nobody can tell what the Russian fishing vessels are going to be doing in 2 or 3 years, but we would like to see some effort made on the principle of a whale habitat sanctuary. We have also made suggestions that the entire fishery be operated as a giant scientific experiment, so that over time we can learn how this ecosystem actually functions. That involves using a variety of closed areas, closed seasons, and things of that sort. I will not go into any more detail on that.

Finally, as to the minerals regime, as I mentioned, we believe that there should be a long-term moratorium on minerals development in the Antarctic and that this would have a positive impact in alleviating tensions in the world community. We think that one of the main reasons the United Nations seems to be getting involved in this question is because of the ongoing minerals negotiations. In recent conversations I have had with a number of Antarctic consultative nations 'ambassadors, they have admitted privately, although they will not say this publicly, that they wish they had not started the minerals negotiations. They think maybe it opened up more troubles than it was worth for them, both internally, where there are very difficult negotiations to work out something between the claimants and the nonclaimants, and then of course in the international community as a whole.

Thank you.

[The statement follows:]

STATEMENT OF JAMES N. BARNES [1]

This statement is presented on behalf of sixteen national conservation and environmental organizations. The organizations are American Cetacean Society, Animal Protection Institute, Animal Welfare Institute, Antarctica Project, Audubon Society, Center for Environmental Education, Connecticut Cetacean Society, Defenders of Wildlife, Friends of the Earth, Fund for Animals, Greenpeace, Humane Society of the US, International Fund for Animal Welfare, Natural Resources Defense Council, Oceanic Society, and the Sierra Club.

I. INTRODUCTION

Although Antarctica is far away and political developments concerning its future are rarely reported in the US, this nation plays a critical role in determining what that future is. The nature of US leadership in implementation of the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), in the negotiation of a minerals regime, in relationships with non-members of the Antarctic Treaty at the United Nations and in promoting the legitimate role of non-governmental organizations in Antarctic policy making will have a large impact on the substantive outcome of many questions in these fora.

Antarctica is the only landmass that can be regarded as part of the Global Commons. In its present relatively pristine state, it is symbolic of the preservation of wilderness and other non-consumptive values for the world. Its wild and mostly untouched landscape and enormous populations of wildlife are a continuing reminder of nature's majesty. Antarctica will be the world's largest wildlife sanctuary once the moratorium on commercial killing of whales takes effect in 1985. The remainder of this century promises to be an important period for the Southern Ocean region, primarily because of the stress implicit in increased exploitation of fish and krill, and possible development of oil and minerals.

The state of human knowledge about Antarctic ecosystems is limited. Thus, our ability to predict accurately the possible impacts of various exploitation options is commensurately limited. A central there of all efforts for protection and conservation in the region is the need for greatly increased basic research on all aspects of the region's ecological structure. This basic research is an essential precondition for sound management policy regarding both living and non-living resources.

All of the organizations represented in this statement support the need for a moratorium on minerals development until the best future use of the Antarctic has been studied carefully. Some take the further step of calling for its complete protection from industrialization, taking the view that Antarctica's best use for the world as a whole is as a wildlife sanctuary, international science preserve and zone of peace.

These organzations would much prefer to see a "protection regime" than a minerals regime being negotiated. The US has been the leading force behind negotiation of a minerals treaty. We sincerely believe that the US and the world community should carefully consider the question of Antarctica's future and should not take actions that allow commercial mineral development through a piece meal process.

The fact that we believe a protection regime is a better goal than is a minerals regime, however, has not prevented us from making many constructive suggestions for improvements to the draft minerals treaty. I will discuss this in a later section.

We have not attempted in this statement to describe the Antarctic Treaty system, since other witnesses have done an excellent job of doing so. Suffice it to say that we believe the Antarctic Treaty is an admirable instrument, containing many provisions that most likely could not be negotiated in today's political and diplomatic climate. Its principles regarding demilitarization, scientific research and respect for the environment are excellent.

We do believe, however, that improvements would be desirable, particularly when confronted with new kinds of activities, ever more bases and larger logistical facilities. In addition, the world political situation has changed significantly since the Treaty was negotiated, which requires a fresh look at certain policies and practices. This statement focuses on some of the changes we believe would benefit the Antarctic Treaty System, the world community, and the Antarctic environment.

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[1] Mr. Barnes is a lawyer specializing in international environmental law. He has represented a number of environmental organizations for the last eight years on Antarctic questions, is a member of the State Department's Antarctic Advisory Committee, and was a public member of the US delegation which negotiated the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). In 1977 he helped found the Antarctic and Southern Ocean Coalition (ASOC). ASOC is comprised of over 150 member organizations located in 35 countries. It has offices in Australia, New Zealand, Germany and the US. ASOC helps citizens monitor inter-governmental meetings on Antarctic and publishes the international newspaper "ECO" at those meetings. Copies of some recent editions of ECO are attached to this Statement. The Antarctica Project is a non-profit, tax exempt corporation located in Washington, DC.

II. ENVIRONMENTAL ASSESSMENT

A. Present Arrangements

The Treaty system lacks any centralized environmental review body or regulatory authority. Indeed, even proposals for a permanent secretariat to be formed have been met with something less that enthusiasm from most ATCPs.

The ATCPs, assisted by the Scientific Committee on Antarctic Research (SCAR), have issued a number of recommendations and guidelines relating to conduct of expeditions, development of bases, waste disposal, protection of species, etc. However, these are really just voluntary codes of conduct. There is no coordination through a management authority. Interpretation and enforcement of measures is left to each individual country.

There are no clear rules under the Antarctic Treaty requiring cooperative environmental impact assessments or analyses in advance of major construction projects. In the past SCAR has recommended such a procedure, but this was rejected by the ATCPs.

Some countries have laws that require environmental analyses of major projects in Antarctica (e.g. the US). But even in those cases the analyses are not required to be circulated to other nations for comment or review, or is the preparer required to consider any views except those of its own citizens in making a final decision to go ahead with a proposed project.

B. Proposals of NGOs

Recommendations of the Antarctic Treaty Consultative Parties (ATCPs) during the last few years have stressed the need for assessment and environmental regulations. But in order for there to be effective impact assessment and regulation, some substantial innovations in normal Antarctic Treaty practice—which leaves individual countries with wide latitude to interpret, implement and enforce agreed rules—will be necessary. ASOC has suggested that these include:

Cooperative international analyses and assessments;
Public assess to all documents;
A right of intervention or participation for private organizations;
Public hearings;
Some form of judicial review;
Collective responsibility for enforcement rather than leaving it up to each individual country.

1. Antarctic Environmental Protection Agency.—The concept of an Antarctic Environmental Protection Agency (AEPA) was first proposed by ASOC last year during the minerals negotiation session held in Bonn, Germany. ASOC based its proposal on the example of the French airstrip at Point Geologie—discussed below—which seemed to demonstrate clearly the need for cooperative international analysis of major construction projects—in advance of their approval by an individual government. Also, ASOC's analysis of the craft Minerals Treaty indicated that the institutions proposed were not adequate to properly protect the environment, as will be discussed below.

ASOC has suggested that there is a place in the Antarctic Treaty system for a separate agency whose primary responsibility would not be to any small group of governments, but to the preservation of the Antarctic environment for the benefit of the entire international community. The organizations represented in this statement believe that the feasibility of an AEPA should be studied carefully by the ATCPs. and we hope that the U.S. will take a leading role in that effort.

Since 1970, more than 110 governments have established high-level agencies with the responsibility for assessing projects that may have an impact on the environment, and then regulating those projects which are approved. In general, these agencies are staffed by full-time professionals, who have no responsibilities to any outside organization.

The AEPA could function according to this model. A headquarters would be established, perhaps in the same location as the Minerals Commission or the ATCP Secretariat (if one is created). The Chairperson could be appointed under the Antarctic Treaty, and would hire a professional staff, drawn from the international community.

2. Functions of an AEPA.—The AEPA might have the following principal functions:

Undertake independent investigations and assessments of all proposed activities—including scientific research, logistic support, construction of bases and mineral development—and review the preliminary assessments developed by companies or governments.

Review available information to determine if it is sufficient to make reasonable decisions about protection of the environment.

Be represented on all Regulatory Committees in any Minerals Regime and on other appropriate bodies in the Antarctic Treaty system.

Prepare environmental regulations for all proposed activities in the Antarctic.

Conduct inspections and monitoring operations.

Report on compliance with rules and regulations directly to the Minerals Commission, the Commission for CCAMLR, the Antarctic Treaty powers and other appropriate international bodies.

Have the right to conduct its own scientific research if necessary to carry out its other functions, and to cooperate with other international organizations in structuring appropriate research programs.

Receive input from the public and interested organizations regarding all proposals, including circulation of draft assessments and regulations.

Protect the integrity of all "proprietary" information which it needed to have access to in order to carry out its functions.

Constitute a forum in which questions could be raised regarding the adequacy of assessments and regulations, compliance with the rules and other matters.

3. Case Study: French Airstrip Proposal for Point Geologie.—In 1979 the French government decided to build an airstrip near its D'Urville base at Point Geologie in Terre Adelieland, an area claimed by France. That research station originally was situated to facilitate study of the Emperor Penguin, rarest of the penguins on Antarctica. Point Geologie is one of the richest sites of fauna in the Antarctica. Some Scientists believe that the migration path of 90% of the Emperors will be blocked, and that noise associated with the airstrip would adversely affect colonies of Wilson's and Giant Petrels.

Eight of the ten birds which nest on the continent are found in this area, and the Emperors are the most accessible to scientists of any colony. In addition, Weddell, Leopard and Crabeater seals live there. Point Geologie is a recommended "priority" site for monitoring changes in the Southern Ocean ecosystem since it contains the most desirable "indicator" species. Among other impacts, scientists say the migration path of approximately 90% of the Emperors will be blocked by the airstrip, and that the noise from planes landing and taking off will seriously interfere with all the birds in the area.

The first environmental study prepared by France was criticized by the French National Academy of Science as being "naive" and completely inadequate, since it analyzed only the impacts on birds immediately in the construction zones and did not consider alternatives. The complete proposal was never submitted to any body of SCAR for review, or to any other country. There were no public proceedings to obtain the views of independent scientists or environmental organizations.

Construction began in January 1982. Approximately 11,000 cubic meters of land were blown up and moved in the first phase of a massive plan to level several small islands and to use the rubble to fill in the gaps between larger islands. Some penguins were killed in the explosions, eggs were smashed, and many penguins carried away by truck from their nesting sites. Under Article VI of the Agreed Measures for conservation of Fauna and Flora (passed pursuant to the Antarctic Treaty), the "killing, wounding, capturing or molesting" of any animal is prohibited except by permit. The conditions for obtaining permits are strictly limited to providing specimens for scientific study or educational institutions, or food for scientists or dogs.

After construction began, many scientists and environmental organizations attempted to have expressions of concern conveyed by other ATCPs to France Greenpeace and ASOC published analyses received from scientists concerning the project, and called on the ATCPs to investigate claims that birds were being killed from explosions and that nests were being destroyed, in violation of the Agreed Measures.

In mid-1983 French scientists made available film footage of the construction, which before then had been denied by France. With the exception of two nations that wrote letters asking for information about the project, however, there was no reaction from the ATCPs and the issue was not placed on the agenda of the ATCPs in any forum.

Because of the public reaction French authorities temporarily halted construction in early 1984 and set up a committee of experts—which included one US and one UK scientist—to re-examine feasibility and environmental impacts of the airstrip. The Committee met in March. It unanimously criticized the project and called for a new environmental impact statement to be prepared by a multidisciplinary team of scientists. A revised statement has been released in the last week, and is apparently open for comment by French citizens for three weeks, although the scientists' report has never been officially released by France. At this point France seems intent on continuing construction this year. We understand that a vessel loaded with materials for the next phase of the airstrip project will leave France in a few weeks.

III. CONVENTION ON THE CONSERVATION OF ANTARCTIC MARINE LIVING RESOURCES

The ATCPs concluded negotiation of a new legal arrangement for management of marine living resources—CCAMLR—in 1980. This agreement contains a novel "ecosystem as a whole" conservation management standard, which requires that possible impacts on dependent and related species be taken into account in setting quotas for target species. There is a special requirement to consider the needs of "depleted" species, such as the endangered great whales. Potentially this Convention is very important, both in its own right and as a model for the management of other fisheries.

While this is a conceptual advance in fisheries management, it is premature to praise the governments that negotiated it: we must wait to see if the Convention can be implemented. From the standpoint of conservation, one must reserve judgment, largely because of the decision making framework which allows a single country to frustrate the majority in setting quotas, conservation measures, data requirements, budget, etc. Even if consensus is achieved at a particular negotiating session, an "objection procedure" allows nations to opt out of complying with measures and quotas after returning home and thinking about what their negotiators agreed to. While many international agreements contain similar "objection" procedures, we know of no other international agreement dealing with fisheries, marine life or conservation that offers such an opportunity for a single nation to block measures designed to carry out the purposes of the agreement.

In addition, the CCAMLR Commission seems to have little power to enforce measures that are adopted. There is no obligatory settlement or dispute resolution procedure. If the International Whaling Convention had similar procedures and voting arrangements to CCAMLR, there would never have been quotas based on sound scientific analysis, much less the moratorium!

We recall the disturbing early "scientific" history of the IWC. Among other travesties, it utilized a concept called the "blue whale unit" for setting quotas, which treated all whales as fungible commodities. That history of ignoring and abusing science guides us to some extent in looking at the management needs of the Southern Ocean today.

An improperly managed fishery may adversely affect not only the krill stocks themselves, but the structure and dynamics of the Antarctic marine ecosystem. The problem is to manage a system already seriously perturbed by the depletion of whale populations, in which the main target species (krill) is the primary food source of an immense number of other organisms.

Timely and appropriate research, coupled with restraints on the expansion of fisheries, can help to avoid the common sequence of overcapitalization and overfishing. Available information on the biology and ecology of krill, krill competitors and krill predators is insufficient to predict the quantities that can be harvested without depleting the target species of altering the numerical and functional relationships among target, dependent and associated species.

A. NGO Participation. For the most part, environmental NGOs have not been permitted to participate actively as observers in CCAMLR. The International Union for Conservation of Nature and Natural Resources (IUCN) is the only NGO oriented toward conservation, and it contains many governments as members. ASOC has petitioned for observer status for a number of years, as have Greenpeace International and several other organizations, but these petitions have been denied. NGOs have, however, monitored the meetings and have made proposals for conservation measures consistant with CCAMLR. These have not been acted on favorably by the government members. NGOs would welcome stronger support from the US in order to obtain a fair hearing for our views, and the right to participate as observers.

B. Implementation of CCAMLR

We have strongly supported legislation to implement CCAMLR, especially the provision that requires the US to set up a directed research program focused on the needs of CCAMLR. We urge that money be appropriated for that purpose, and that congress examine existing international research programs that the US might usefully participate in to a greater extent. For example, the BIOMASS program—Biological Investigations of Marine Antarctic Systems and Stocks—has not been favored by US policy makers in recent years. Yet it is the only major international effort to understand the marine ecosystems of the Southern Ocean. It is an unfortunate situation when the US, which lobbied so strongly for the "ecosystem as a whole" approach during the CCAMLR negotiation, has not more than a minimal participation in BIOMASS. We hope that this and other interested committees of Congress will examine the situation closely.

1. Need For Strong US Leadership.—Given the difficult decision making structure of CCAMLR, it is imperative for the US and other "conservation minded" governments to exert strong, consistent leadership in implementing the Convention. This will mean support for a significant US research program directed at an overall understanding of how Antarctic ecosystems function. It will require a willingness on the part of US negotiators to propose innovative measures for implementation and to lobby hard for these proposals at the diplomatic levels. We may have to expend some "diplomatic capital" to convince other nations that we are serious.

2. Data That Could Be Helpful.—Various US agencies possess much scientific data that is pertinent to the understanding of Antarctic marine ecosystems. The CCAMLR secretariat has asked all member governments to submit such information, to be transferred to a new master data base, but the US has had some difficulty in complying with the request because of budgetary constraints. If the US is going to be in a diplomatic position to request full disclosure of fishing data from fishing nations, it should be expansive in accommodating the Secretariat's request.

Other pertinent data also is available, awaiting only the funds to extract it. For example, the old whaling records of catches dating back to the 1920s are stored in several archives, primarily in the UK. They would provide good information about historical whale feeding grounds, month by month as the pack ice recedes. This could be very useful in determining what areas to close to krill fishing, and other "experimental" approaches to management in the Southern Ocean.

C. NGO Proposals

We believe conservation and protection of Antarctic wildlife and ecosystems should be an important priority of the US. One of our key concerns is the fate of endangered whales in the Southern Hemisphere, which depend on the bounties of the Antarctic marine ecosystem for their survival and recovery. As many scientists and commentators have noted:

Krill fishing is concentrated in ice-free areas that are the major feeding grounds of krill-eating baleen whales;

Krill fishing occurs primarily in the summer months when whales are also in their Southern Ocean feeding grounds;

Several baleen whales exist at small fractions (less than 5%) of their historical stock sizes. The Blue whale, largest animal ever to live on the earth, recently has been estimated to have around 1000 individuals left in the Antarctic; and

In order to maximize efficiency of fishing operations, fishing effort is focused on the same high-density "swarms" of krill upon which the baleen whales feed.

We conclude that a commercial krill fishery competes directly with baleen whales, and that the severely depleted stocks of blue, humpback, southern right and fin whales could be adversely affected by quite low levels of krill harvesting, especially if the fishing is concentrated.

That is why we have called for (1) establishment of large whale sanctuaries in the Southern Ocean, free of krill fishing, oil prospecting and other industrial activities, and (2) a quota on the krill fishery at its present reported level until there is sufficient understanding to set higher quotas, by area.

1. Whale Habitat Sanctuaries.—Thus far, no government has put together the necessary supporting materials and political plan to achieve the goal of setting up "whale habitat sanctuaries" in the Southern Ocean. As a leader in the long effort to protect whales from direct harvest, the U.S. should now take the lead in developing this concept, especially to help ensure the recovery of endangered and threatened species.

Our own laws covering endangered species provide both a mandate and a model. Obviously the IWC and its Scientific Committee will need to be involved in this effort. The Commission and Scientific Committee for CCAMLR will have to be involved directly, in order to limit krill fishing in any sanctuary. And the Antarctic Treaty Consultative Parties, now negotiating a minerals regime, have an obvious role.

RECOMMENDATION

The krill fishery should be closed in certain areas (as provided in article IX(2)(G) of CCAMLR) in order to protect whale feeding grounds and for scientific purposes.

2. Overfishing by USSR.—Fishery development in the Southern Ocean has proceeded to the point where it is a major world resource. The USSR has heavily overfished certain finfish stocks during the last 12 years—Marbled Notothenia, Scaled Notothenia and Antarctic Icefish—and resists making available the data needed to evaluate the situation and impose responsible measures. The US must insist that the USSR provide this data and that the Scientific Committee and Commission properly analyze it. The most recent CCAMLR session, which finished last week, raises concerns about the resolve of member governments to do this.

RECOMMENDATIONS

1. Fishing States should be required to submit all fishing data for the past fifteen years so that the status of finfish stocks can be properly evaluated.
2. Based on present scientific evidence, there should be a moratorium on all finfishing for ten years.
3. A quota should be established for krill fishing at the present reported level until such time as a scientific basis exists for setting higher quotas, by area.
4. A management strategy should be developed for Southern Ocean fisheries which treats harvesting as one component of a large-scale scientific experiment. A key element in this approach would be the use of different harvesting strategies in different geographical areas. Some areas should be closed. In areas subject to harvesting there should be various seasonal restrictions. All quotas should be set by area, with any buildup allowed to occur slowly. Research programs should be designed to utilize various "indicator" species or parameters, the goal being to gain insight into the dynamics of the Southern Ocean and to "model" the system.
5. Scientific and technical personnel should be on board all fishing vessels, or at least a significant percentage of vessels, to provide an independent source of data and scientific research. The Convention provides for this but as yet the provision has not been implemented.
6. Pelagic drift nets should be banned within the CCAMLR area and the use of bio-degradable plastics encouraged. Incentives to pick up lost nets and other floating plastic debris which often entrap marine mammals and birds should be established.

Each of these recommendations would require that the new Convention be used actively, to manage the fisheries. This is in contrast to the apparent philosophy of diplomats now in charge of policy for the member governments, which is to allow the status quo to continue on the assumption that no major catastrophes will occur. To their credit, US negotiators have raised some of these questions.

IV. DRAFT CONVENTION ON A MINERALS REGIME

For the last several years the ATCPs have been trying to negotiate another new legal regime to cover mineral resources. Negotiating sessions have been held in Wellington, New Zealand (June 1982 and January 1983), Bonn, West Germany (July 1983), Washington, DC (January 1984) and Tokyo, Japan (May 1984). The next session is scheduled for Brazil (February 1985).

The documents being considered in the minerals negotiations are not released by the governments involved to the public for analysis and comment, nor are NGOs allowed any opportunity to formally participate as observers. These sessions are closed totally to other nations, the press and the public. Nonetheless, NGOs have managed to obtain copies of some documents being considered in the negotiation and have analyzed them.

The Antarctic Treaty does not deal with the question of mineral resources. Some ATCPs (such as the USSR) maintain that minerals development would be inconsistent with the Treaty without an agreement on how such activities should be allowed and regulated, while others (such as the U.S.) view minerals development as a "peaceful use" permitted by the Treaty.

A. Policy of Voluntary Restraint

In 1977 the ATCPs agreed to a policy of "voluntary restraint" on "all exploration and exploitation of Antarctic minerals resources," conditioned on "satisfactory progress" being made towards a minerals regime. The scope of the policy remains unclear and it is not legally binding. It was agreed to in lieu of an indefinite moratorium on all minerals activities.

B. Summary of Draft Minerals Treaty

The draft minerals treaty would give exclusive licenses to commercial entities to explore and exploit large areas, and would protect "proprietary" rights over all information obtained in connection with prospecting, exploration and exploitation.

The regime would allow prospecting without any significant decision making or regulation. At the exploration stage, a Commission of all full members would have to agree to open a particular area to minerals activities. It remains unclear whether that key decision will be made by consensus or by some lesser majority. We urge that the U.S. firmly support consensus for this important decision. No size for "opened areas" has yet been agreed upon, but some governments foresee blocks as large as one million square kilometers.

For each area opened, a small Regulatory Committee of eight nations—evenly balanced between claimants and non-claimants—would manage the activities.

An Advisory Committee would be established to furnish scientific and environmental advice to the Regulatory Committees and Commission. It would not be a permanent body but would be composed of representatives designated by governments for each meeting. It would make recommendations on environmental protection issues, among other responsibilities.

Those institutions will be faced with multinational companies skilled in "bending the rules" in order to achieve their acknowleged goal of making profits by extracting minerals. If, as so often happens, there is a coincidence of view concerning a project between a government and a company, protection of the environment will be even more problematic.

There are many serious environmental problems that would have to be faced if mineral prospecting, exploration or development takes place in the Antarctic. Suffice it to say that considerable regulation will be needed, much of it involving new technology in very difficult conditions.

A critique of the draft minerals treaty is contained in the most recent set of ECO newspapers, published by ASOC at the Tokyo minerals negotiation from May 21-31, 1984, and is attached to this statement.

C. Role of NGOs

Although no NGOs are allowed to formally observe the minerals negotiation, ASOC members have monitored every session. They have provided delegates with critiques of the draft agreement and with substantive proposals for improvements, including strong environmental principles. ASOC has hosted several formal workshops for the diplomats to discuss topics such as protected areas and an Antarctic Environmental Protection Agency.

But the secrecy of the negotiation raises formidable barriers to substantive participation. On the one hand, NGOs are criticized for not putting forward more specific proposals, while on the other they are criticized for obtaining access to the documents needed to make intelligent proposals.

ASOC has expressed doubt that the institutions and procedures proposed will have the requisite independence, professional staff, continuity, exclusive focus and public input to ensure adequate environmental protection. This is another justification for establishment of an Antarctic Environmental Protection Agency.

Many NGOs have urged that a "protection regime" be negotiated instead of an "exploitation" arrangement, but they have also put forward constructive proposals for improvements in the draft minerals treaty.

One example of such proposals is contained in the attached Memorandum dated March 9, 1984 to R. Tucker Scully from ten environmental and conservation organizations. It contains major substantive proposals that are consistent with the U.S. position in the negotiations. Unfortunately, it is unclear whether these proposals were ever considered seriously by the Antarctic Policy Group, or whether U.S. negotiators intend to pursue them in the future. It is likewise unclear how U.S. negotiating priorities are being set in the context of assuring corporations wide flexibility, on the one hand, and protecting the environment on the other.

D. The Concept of "Full Protection"

1. Wilderness Values.—As Geoff Mosely, regional councilor from Australia for the International Union for Conservation of Nature and Natural Resources (IUCN) has written, "The common understanding of the meaning of 'wilderness' area has not changed much since Dr. Johnson defined it some two hundred years ago as 'a tract of solitude and savageness'."

The U.S. Wilderness Act of 1964 defines a wilderness as "an area where the earth and its communities of life are untrammeled by man . . . where man himself is a visitor who does not remain . . . and which generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable . . . ." Other countries have similar legislation.

Another important aspect of "wilderness" in the Antarctic is the status of animal populations. Antarctica has the largest populations of wildlife left in the world, tens of millions of marine mammals and birds that are free to migrate, feed and breed as they have for countless numbers of years in their natural state. Although humans have, in the past, harvested whales and seals in Antarctica in tremendous numbers, this phase appears to be ending with the institution of a commercial whale moratorium in 1985. In fifty years it is likely that Antarctica will be seen as the last great wildlife sanctuary in the world. There is "value" in that being so both for the animals and for humans.

"Antarctica presents an opportunity for wilderness conservation on a hitherto unequalled scale. The Continent has an area of 13.2 million square kilometers. By comparison the world's largest terrestrial national park in Greenland covers only 0.7 million square kilometers, and the Great Barrier Reef Marine Park—the world's largest marine park—covers a mere 0.3 million square kilometers. . . . [T]he sheer size of the Antarctic, its remoteness, the lack of a clear cut national jurisdiction and the nature of the benefit which could be promoted would place the wilderness reservation of this region in a class of its own." (Mosely, 1984)

2. ATCP Practice.—The principle of conserving wilderness, including large-scale habitat for wildlife, has not been recognized in any formal statement by the ATCPs, and none of the conservation measures passed pursuant to the Antarctic Treaty system have been directed to that end. This practice extends to bodies closely related to the Antarctic Treaty, such as the Scientific Committee on Antarctic Research (SCAR). For example, the report of SCAR's Group of Specialists on Antarctic Environmental Implications of Possible Mineral Exploration and Exploitation (1983) does not mention the possible effects on wilderness. None of the many recommendations agreed to by the ATCPs during the last twenty-four years relate to wilderness values. The system of protected areas established under the Treaty does not cover wilderness or other large areas.

The present system of environmental controls over scientific and logistic operations in the Antarctic does not evaluate the impact of a particular base or airstrip on wilderness or habitat values, nor is the cumulative impact of additional facilities taken into account.

The proposed minerals regime, if brought into operation, would allow the destruction of wilderness by a gradual, cumulative process, without any decision being made regarding protection of the overall character of the region.

3. History of World Park Concept.—The first important move toward formal protection of wilderness in Antarctica was taken at the Second World Conference on National Parks, held in Yellowstone Park in 1972. The Conference agreed to a resolution that refers to "the great scientific and aesthetic value of the unaltered natural ecosystems of the Antarctic. . . .," and called on the nations party to the Antarctic Treaty to "negotiate to establish the Antarctic Continent and the surrounding seas as the first world park, under the auspices of the United Nations."

That resolution was sent to the ATCPs by IUCN, but was never formally considered by them as a group. In 1975 the New Zealand government formally proposed that Antarctica be given World Park status, offering to give up its territorial claim there if other nations did the same. Chile was also supportive of the World Park concept, although it was willing to do so only on the understanding that its claim would remain. No other ATCP was willing to follow the New Zealand lead, nor was the question ever debated or considered in a Consultative meeting.

In 1977 the Antarctic and Southern Ocean Coalition (ASOC) was formed. One of its goals has been to promote the study of the "full protection" concept for the Antarctic. ASOC members have circulated World Park petitions in many countries during the last few years. These petitions, containing the signatures of hundreds of thousands of citizens from around the world, will be presented to the UN Secretary General this year in connection with the UN debate on the future of Antarctica. A copy of the petition is included with this statement.

4. Proposals at the UN.—In briefing documents prepared for the first UN debate on the future of Antarctica a number of NGOs proposed that serious consideration be given to fully protecting the Antarctic from industrialization. Greenspeace International Council, for example, suggested that the World Heritage Convention might be utilized to allow every nation to nominate the totality of its interests in the region for protection.

One can imagine a Protocol to the World Heritage Convention dealing specifically with Antarctica, which incorporates the creative approach of Article IV of the Antarctic Treaty regarding claims to sovereignity, in a context wherein all nations nominate the totality of their perceived interests for "protection status." Such a document need not be inconsistent with the Antarctic Treaty, and could facilitate a "meeting of the minds" between claimants—all of which are members of the Antarctic Treaty, and non-claimants—some of which belong to the Treaty and others which do not.

5. IUCN Resolutions and Practice.—In its 1981 Resolution on Antarctica the International Union for Conservation of Nature and Natural Resources (IUCN) recognized "the importance of Antarctica and its Continental shelf and the Southern Ocean for the world as a whole, particularly in maintaining the stability of the global marine environment and atmosphere, and the paramount importance to mankind of its great wilderness qualities for science, education and inspiration."

That resolution called on the ATCPs to "ascribe to the Antarctica environment as a whole a designation which connotes worldwide its unique character and values . . .," noting that "any exploitation of minerals would adversely affect the values of the Antarctic environment," and urged the ATCPs to foster measures that would "maintain for all time the intrinsic value of the Antarctic environment for mankind and the global ecosystem.

The resolution requests the ATCPs not to bring any minerals regime into operation until "full consideration has been given to protecting the Antarctica environment completely from mineral activities. . . ."

These points were endorsed at the World National Parks Congress in Bali in 1982, which also stated that "the concept of a world park and other appropriate designations should be developed more urgently."

It should be noted that eleven of the sixteen ATCPs are members of IUCN, and that their representatives agreed to these resolutions.

There are many possible ways to accomplish a "protection regime"—if nations have the will to do so. An interim approach would be international agreement on a moratorium against all minerals exploration and development (either in the Antarctic Treaty context or in the UN, or in both fora). Another approach would be to negotiate a World Park or Preserve regime. This could be accomplished pursuant to the Antarctic Treaty or in the UN.

The Man and the Biosphere Program has been applied on all continents other than Antarctica, and could offer a framework for application to the Antarctic. Likewise, as mentioned above, the World Heritage Convention could be useful.

But the important thing is not to foreclose options at a point in time when our ignorance of the impacts of minerals development is so overwhelming, and our understanding of the values to be obtained for the world community by taking a "full protection" approach is so limited.

V. THE UN DEBATE

In part because of the mineral negotiations, some non-members of the Antarctic Treaty have taken a number of initiatives at the United Nations. Essentially they have asked, by what right does a small, self-appointed group of countries decide to develop an Antarctic minerals regime without consulting and involving other countries? Some of those nations have suggested that Antarctica should be part of the "common heritage of mankind". For the first time, the UN has placed the question of Antarctica on its agenda, and a comprehensive Study is being prepared by the UN Secretariat for use at the debate in New York later this year.

ASOC members generally have welcomed the UN Study on Antarctica—required by a Resolution of the General Assembly—as an opportunity to inform all member states of the unique values and possibilities for cooperation in the Antarctic. Whatever one's juridical views about Antarctica, in a functional sense it is a "commons", not subject to the exercise of sovereignty of any small group of nations. Thus, it is important for all nations to think about the best future for this region, taking the long-term perspective.

Regarding that Study, the environment organizations listed above believe very strongly that ALL options for the future of the region must be studied carefully—including the option of "full protection". We also believe that the concept of the "rights of future generations" of humans and wildlife should be given consideration. If future generations have rights, then this generation has some obligations.

Because any major changes in the south polar icecap and the ice shelves which fringe the continent could have effects on ocean levels and the global climate, all nations have an interest in the maintenance of the environmental stability of Antarctica. Also, there is a broad international interest in various benefits of Antarctica: monitoring zone global pollution; free scientific preserve; main feeding ground for the great whales; possible major supplies of protein for people; the world's only truly demilitarized zone with an associated inspection agreement for facilities and activities; zone of peace providing valuable experience in international cooperation. ASOC members have supported the right of all interested nations to have a voice in decisions affecting the region.

At the same time, ASOC members have encouraged countries to join the Antarctic Treaty, particularly in light of recent steps by the ATCPs to open the Treaty System to wider international participation.

VI. PROPOSAL FOR A MORATORIUM

Given our ignorance of how Antarctic ecosystems work, what areas are especially vulnerable and the best long-term values of Antarctica for the world as a whole, it is prudent to establish an internationally agreed moratorium on all minerals activities. During this period a number of important tasks can be carried out.

A Conservation Strategy for Antarctica and the Southern Ocean could be developed. Such a strategy could address the question of what areas are most vulnerable to different kinds of human activities, what areas are most valuable to wildlife in terms of habitat for breeding and feeding, which areas should be protected for purely scientific work. The value of not allowing industrial activities could be considered carefully. The research necessary to properly implement the "ecosystem as a whole" concept in the CCAMLR could be identified and begun.

If a moratorium could be agreed within the overall international community, it would have significant political value, given the divergent viewpoints expressed by members and non-members of the Antarctic Treaty about the proposed minerals regime and the question of possible exploitation of Antarctic minerals.

VII. CONCLUSION

What are Antarctica's primary values for the world, taking the longer term point of view and bearing in mind the needs of future generations?

Many people would rank its arms free/nuclear free character very high. In a world which spends more on weapons than on food, it is comforting to know that nations have been able to place one large area of the earth off limits. Should we not ask our diplomats to use this as a model for creating other such sanctuaries in the world?

Another interesting aspect of the Antarctic Treaty system gives any full member the right to conduct on-site inspections of bases and facilities. This type of inspection provision is precisely what the superpowers are asking for in other arms control agreements. Why not build on the precedent now operating in the Antarctic?

There are special possibilities for international cooperation in peaceful scientific endeavors in the Antarctic. We should appreciate the value of the Antarctic "commons" for science. This is particularly appropriate given Antarctica's unique qualities: the secrets it holds of the earth's past, its capabilities as a monitoring zone for how we are—collectively—poisoning the earth, and its many other scientifically valuable aspects. For the most part, these scientific values would be eroded if the relatively pristine qualities of the region deteriorate.

Many people would note the amazing concentrations of wildlife in the Antarctic, the astounding beauty of its landscapes and mountains and ice, its "wilderness" qualities in a world moving too rapidly to "conquer" nature. Antarctica will be seen by future generations as the last great wilderness—if we can find the will to leave it to them.

Finally, potential food production in the form of krill (the tiny shrimp-like crustacean which is the foundation of the entire marine ecosystem in the Antarctic) and fish would be ranked as a high value by many people. In the year 2025, when the earth's population will be several billions more than now, the value of Antarctic protein could be very great.

Now, what could adversely affect those values? If a huge oil field—"super giant" in the words of the oil companies—existed in Antarctica, who would be the principal beneficiaries, and what would those nations be inclined to do? Some of us fear that such a "strategically valuable" resource could undermine the arms free character of the region.

If oil were found in large quantities, what would that mean for other values—such as science, wildlife, wilderness and food? Many environmental organizations believe that these values are inconsistent with industrialization, and may be incompatible in the event of large accidents. Most experts believe there would be accidents, given the terrible operating conditions—the worst in the world, with enormous icebergs and vicious storms.

The Antarctic furnishes an opportunity to demonstrate our maturity. It can be a rallying point on the world's agenda for taking care of our patrimony, the natural resource base of the earth. If we can do this, future generations will applaud our wisdom.

Senator GORTON. Thank you, Mr. Barnes.

Dr. Brown.

STATEMENT OF DR. WILLIAM Y. BROWN, ACTING EXECUTIVE DIRECTOR, ENVIRONMENTAL DEFENSE FUND

Dr. BROWN. Mr. Chairman, my name is Bill Brown. I am the acting executive director of the Environmental Defense Fund, and I am here today on behalf of EDF.

I want to thank you for the opportunity to testify on behalf of the Antarctic, and I also want to thank you for saving the questions for the end. Whether intentionally or not, you have forced my colleagues who are witnesses to stay until the bitter end of my testimony, rather than sneak off beforehand, as they would no doubt widely prefer.

The Antarctic Treaty system is a rare success in the collection of multilateral regimes. It has fostered unprecedented cooperation among nations in scientific research and may be the most effective peace treaty in existence.

The treaty system also has prevented any significant manmade degradation of the Antarctic environment. Two natural resource demands now challenge the treaty system: the demand for fishery products and demand for oil. Fisheries for krill and several other fish stocks have led to the adoption of the Convention for the Conservation of Antarctic Marine Living Resources, known as CCAMLR.

The CCAMLR is unusual among international fisheries regimes because it was prompted and designed for the protection of the entire assemblage of organisms in the southern ocean that might be disturbed by fisheries, not just the populations that are harvested. The potential effect of krill harvests on animals that eat krill, endangered whale species in particular, has never been far from center stage in CCAMLR.

The risk posed to depleted whales by increased krill harvests may be compounded by increases in abundance of other krill predators. For example, Adelie penguins, crabeater seals, and minke whales in the southern ocean apparently increased following depletion of the blue whale and other large whale species.

The "surplus" of krill that some thought would be present after the big whales were knocked down may have disappeared in the bellies of these smaller creatures. If so, the large whales may be facing food shortages at lower levels than were present before the era of whaling, and a large krill fishery could add to this shortage and impede recovery. However, the krill fishery is not currently large.

CCAMLR is probably the best multilateral agreement that could have been expected. Its ecosystem conservation objective is innovative and it authorizes the regulatory mechanisms necessary to accomplish that objective.

The weakest link of the treaty is the requirement of consensus on matters of substance. The Soviets, for example, are thus empowered to veto any proposed decisions under the CCAMLR. Without such a consensus requirement, however, the Soviets probably would not have become a party. The Soviets currently take about 90 percent of the krill harvest. It is better to have a consensus requirement and the Soviets in the treaty system than to have neither one.

Two committees of the House of Representatives have held hearings on legislation to implement the CCAMLR. The appendix [1] to this testimony contains my testimony before one of those committees, including draft statutory language and a copy of a paper on the conservation of Antarctic marine living resources. I commend this detailed information and set of recommendations to the subcommittee.

Since adoption of the CCAMLR, the Antarctic Treaty nations have had intensified efforts to negotiate a regime addressing the use of mineral resources. Attention has focused on the political and environmental consequences of finding, extracting, and transporting oil from the Continental Shelf.

Drilling for oil in the Antarctic is an environmentally dangerous proposition of questionable economy. The risks and high costs of Arctic oil development are present and compounded in the Antarctic. Icebergs scour the seabed at much greater depths, pack ice will block access to spills in winter, distances from points of processing and distribution are greater, and the environment is generally more hostile.

On top of these risks and costs, oil reserves in the Antarctic are poorly described. Perhaps Antarctic oil should never be extracted. Apparently any production is decades away.

These points of fact do not mean, however, that a minerals regime should not be negotiated now. To the contrary, it is better to negotiate environmental safeguards and political accommodations now, rather than wait until demand for oil may rise and instill counterproductive haste and confusion in the process.

The provisions of the minerals regime itself are not settled but their evolution so far is generally satisfactory to EDF. Much of what we have asked for has appeared as draft treaty language and has been considered acceptable by many of the nations involved. Some of our recommendations have not appeared, but I would not call the process unsatisfactory to date. We support continuation of the process.

Moving to greater abstraction, Mr. Chairman, Malaysia and several other nations have questioned whether the Antarctic Treaty system should be revised or replaced. Some would like to see the United Nations involved in Antarctic management. Last year's

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[1] The statement is in the Committee files. See House Committee on Foreign Affairs, printed hearing record of April 12, 1984.

General Assembly request for a study of Antarctica is a move toward that end.

Discussion by the United Nations may benefit the Antarctic. The simple existence of that discussion should prompt further opening of the treaty system. The treaty system should not be replaced by another regime, however, such as a regime that might be adopted under the aegis of the United Nations.

The Antarctic Treaty system has succeeded in keeping the peace among nations with sharply conflicting views of territorial sovereignty. The treaty system has prevented Antarctica from becoming a testing ground for war. The Antarctic environment has fared well under the treaty system in the past. The CCAMLR and emerging minerals regime give optimism for the future.

Any system will need revision over time, but a system with such success should be maintained unless a compelling case has been made for more dramatic change. No such case has been made. In the long run, a new multilateral regime embraced by nations with less demonstrated interest in the Antarctic could lead to discord and less care for the environment. Inhibition of development by uncertainty and desire for future, rather than present, profit is not a satisfactory solution to the challenge of enduring environmental protection.

Thank you for the opportunity to express these views, Mr. Chairman.

Senator GORTON. Thank you. Now, Dr. Brown, why don't you stay here, and let us have the other seven of you come up and we will ask questions of you together.

While the other seven are coming up, Dr. Brown, I will ask one that is directed precisely at you.

You have attached to your testimony what you gave to the Committee on Foreign Affairs in the House about recommendations for change in the proposed implementing legislation for CCAMLR.

Has there been any progress in that direction?

Dr. BROWN. As far as I know, the House has not passed anything. The reason I gave that to this committee is in the hope that you, in conjunction with the Senate Foreign Relations Committee, could pursue passage of a bill in the Senate.

Senator GORTON. Mr. Scully, we will start with you on this one, but I will be happy to have comments from any of the other witnesses as well.

Several of the witnesses here today identified areas of weakness in the Antarctic Treaty system, including the decisionmaking procedures in CCAMLR which require consensus and allow for objection, the lack of procedures for consultative parties to review and challenge activities of other parties with regard to damage to the environment, and the need for coordination and consistency generally.

Among the witnesses there are suggestions to address these weaknesses, including Mr. Barnes' suggestion of a centralized environmental review body and Ms. Kimball's ideas on enhancing the acceptability of the treaty system.

Again, starting with Mr. Scully, will you comment on these weaknesses and the suggestions and tell us whether or not these points are part of any continuing discussions among the parties?

Mr. SCULLY. Thank you, Mr. Chairman. That is a rather large order.

I will try to summarize my comments rather briefly.

First, I think that the Antarctic Treaty system is probably the best example of a dynamic legal system, legal and political system of a multilateral character that has been negotiated certainly since the U.N. Charter. It has demonstrated I think a proven capacity to evolve, to adapt, to new circumstances, and to address new issues.

My general response to all of those questions would be yes. There is a forum in which these issues are under consideration, and to the extent that the points are well taken, I think that the system will demonstrate the ability to deal with them in an effective fashion.

More specifically I don't see the consensus system as in and of itself a weakness. The instruments that have been negotiated under the Antarctic Treaty have all been negotiated by consensus, and I think that is quite a remarkable achievement, given the differing views among the parties as to the legal status of Antarctica, given the kinds of differences that those parties display in their bilateral relationships with respect to other areas of the world.

So I don't think the consensus principle is one that should be denigrated as such. It can, I think, if misused become a means of blocking decisions. It can be a means of inhibiting action rather than permitting necessary action. However, as it has been implemented, as it has been employed within the Antarctic Treaty system, it has been a method of securing the best kind of negotiated solution to particular problems and has achieved negotiating results which are durable and lasting rather than those that might soon fall apart.

Thus, I would not agree that the consensus system in and of itself is a weakness of the system.

Looking at the question of on Antarctic environmental protection agency, I do not agree with the need for a centralized decisionmaking body of that sort.

I certainly do agree that there is a need, as I think Dr. Byrne highlighted in his testimony, for ensuring necessary coordination of activities within Antarctica, and I think steps are being taken in that regard.

Insofar as the points made by Lee Kimball on ensuring the greater participation within the Antarctic Treaty system, ensuring the greater availability of information about the system, I think that those points are quite well taken.

In fact if one looks at the operation of the system within recent years, if one looks at the steps that have been taken at recent consultative meetings of the Antarctic Treaty parties, I think one will see that the parties are addressing these issues and, though perhaps not as rapidly as many would like, they are in fact developing innovative and effective responses.

Finally, there was a point with regard to the enforcement and means of bringing concerns of individual parties to the attention of others with respect to the environmental effects, let's say, of actions being taken on a national basis. This is an area in which responses are developing. It is an area in which there is a need.

At the consultative meeting in Australia last year there was considerable discussion of environmental assessment procedures, essentially the equivalent of the kinds of EIS procedures we already apply to our own major actions, and of means by which such procedures can be developed on an individual basis by each of the parties, and of ways in which the procedures could be made a collective responsibility .

I think the response is coming. It may not be as fast as some would like, but it is coming.

Senator GORTON. Would any of the rest of you like to respond?

Ms. KIMBALL. Just a few quick remarks. I agree with Tucker that the system is responding on things like coordination and consistency within the regime and trying to develop environmental impact assessment procedures.

The two areas where the response may not be coming or certainly not fast enough, are in how to incorporate the observer comment function on what happens under the Antarctic Treaty itself that now exists in CCAMLR and that will presumably exist in the minerals regime. There is no mechanism now for either observer comment or public comment on logistics and scientific activities under the Antarctic Treaty. I hope that this will be part of the environmental assessment procedures that are being worked on now. And second, in the area of inspection, where as I mentioned in my testimony, I think there could be some improvement.

Senator GORTON. Mr. Barnes?

Mr. BARNES. Just following up on one thing Lee said, which I fully agree with, about the role of observers. You know, although it has gotten some development in the CCAMLR context, no environmental NGO's are really allowed to participate. The only conservation-oriented group that is allowed is the International Union for Conservation of Nature and Natural Resources, which is kind of a hybrid organization that is comprised of governments and agencies of governments and also some conservation and environmental groups. A number of members of the Antarctic and Southern Ocean Coalition that I have described in the statement have applied for observer status within the last 4 years and have always been turned down.

We would greatly appreciate stronger U.S. support for our participation because we think it would strengthen the whole system for us to be allowed to be on the inside, like we are in other international forums.

Senator GORTON. Dr. Hofman?

Dr. HOFMAN. I would just like to make a couple of comments relative to the last point concerning observers.

Both Jim and Lee have participated on U.S. delegations as NGO's. The United States was the first I think to include NGO's on its delegations to meetings concerning Antarctic matters. That example has led to NGO's being included on a number of other delegations.

With respect to the question that Lee just raised concerning public comment on issues relating to the possible impact of logistics and other activities under the Antarctic Treaty, it is true that there isn't a system whereby any member of the public in any nation can comment on any nation's activities. There is provision in the United States, however, for public review of proposed activities and, again, I think that this has led to the development of similar provisions in some of the other countries.

I agree generally with the points that Lee made, however.

Senator GORTON. Thank you.

With respect to the feasibility of minerals development, is present day technology adequate for discovery and development of potential resources, and are any companies or consortia prepared to begin minerals exploration and development, or alternatively, are we talking about something that is a long way in the future?

Any of you.

Dr. Zumberge?

Dr. ZUMBERGE. The answer to all your questions is no.

Senator GORTON. Does anyone disagree?

Mr. SCULLY. I find it very difficult to disagree with Dr. Zumberge. The only point I would make is that insofar as exploration goes, using geophysical techniques, that kind of mineral resource activity can take place, and in fact, it is almost impossible to distinguish with regard to the nature of the activity itself between scientific research and the initial stages of exploration.

The real question is the intent of the entity or the operator undertaking the activity. With that slight qualification, I certainly agree entirely with what Jim has said.

Mr. BARNES. I think one thing that has concerned a lot of the environmental groups that I worked with the last few years is the timing and likelihood of minerals activities. In our talks with high officials of countries, particularly Norway, we have learned about the developing subsea completion technology for drilling on a very deep shelf. The shelf structure they have off the North Sea coast is about 350 meters deep, and according to the people that we have been talking to over the last couple of years, they expect to have that technology on line in the next 2 or 3 years.

They tell us they can't see any real distinction between drilling at 350 meters on that shelf with that technology and drilling at the 500-meter level in the Antarctic.

A lot of people say, well, there's not going to be any development until the end of the century. The end of the century is only 16 years away. It is not like it is a long time away.

Senator GORTON. So when you call for a moratorium on minerals activities, it is this kind of activity on the part of Norway which you have just described that you are thinking about?

Mr. BARNES. We would like to see a moratorium on any minerals prospecting. I know there is a tough line to draw between scientific research and prospecting, but it has to do with the intent, generally, of the parties and what they expect to do with the information and how the information is held, whether it is public or private. But we would like to see a moratorium that covered all minerals activities, whether it is prospecting, certainly the exploration and drilling of the sort that I am talking about now and of course commercial development.

And one last thing. One of the aspects of this regime as it is unfolding that is bothering us is that the structure that is set up, as we read it—we could be wrong—but the way we read it is that once a decision is made to allow an exploration license, it is virtually automatic to go to the development stage if the company wants to go. The decisions are in the hands of a very small group of countries in the so-called regulatory committees—eight nations—and it is this automaticity that we are really very concerned about, piecemeal process, moving toward development rather than considering the overall "big picture" as we would put it.

Senator GORTON. Dr. Zumberge?

Dr. ZUMBERGE. The fact that the Norwegians have developed a deep drilling technology is not going to stimulate the development and exploitation of Antarctic offshore oil if it exists. The stimulus will be an economic one, and at $25 a barrel for oil, that stimulus is simply not there.

Senator GORTON. At what price would it be?

Dr. ZUMBERGE. No one knows. If you look over the history of the oil companies and their desire to develop nonconventional sources of energy such as refining tar sands or producing oil from shale, all of those were predicted on a price of oil a few dollars above the current price, but as the price escalated, the cost of pursuing these alternate sources of energy also escalated, and as a result, none of them developed in this country without Government subsidies, as we have seen in the development of gas from coal in the high plains and oil from shale in the West.

Where they have not been guaranteed by Government subsidies, they have all been abandoned because of their uneconomic status in the current price of energy. And to claim that technology is going to stimulate Antarctic exploration for oil is simply not the case in my opinion.

Senator GORTON. Dr. Brown, you made the case for the negotiation of a minerals regime now. Does that mean you oppose a moratorium?

Dr. BROWN. I guess I haven't even thought in terms of supporting or opposing a moratorium, although maybe the answer is that I would oppose a moratorium insofar as I think the right way to approach the issue is evaluating what are the necessary environmental safeguards for development of oil resources in the Antarctic, and putting together a regime to ensure that those safeguards are implemented. And the draft minerals regime, which is not finalized yet so we don't know quite what it is gong to be, in my view, has been largely successful in doing that.

In the first place, I think that is the only rational way to try to accommodate the economic needs of those nations that are involved. They are not going to, I think, address the issue in terms of a moratorium or lack of moratorium, and I am not sure that the Environmental Defense Fund wants to make it that black and white either. So we support the process that is now going forward.

Senator GORTON. Thank you.

Mr. Scully?

Mr. SCULLY. Just one comment on the concept of the regime which I think relates to a number of points that have been made.

What is being developed is essentially a system for making decisions. That system will start with the presumption—and I emphasize this fact—that no mineral resource activities which permit an operator to obtain a right to a resource should be or will be permitted unless there is a positive decision to allow such activity to go forward. The system would start with presumption against the activity.

This is in contrast, and I think the point should be noted, to other kinds of instruments that have been negotiated within the Antarctic system. There is an agreement that it should start from the presumption that the area is closed to the activities—mineral resource activities—until and unless decisions are taken to permit them. The quesiton then becomes would be the conditions under which activites otherwise prohibited could take place.

It is, of course, our objective to ensure that there would be no artificial stimulation, nor any artificial disincentive to the undertaking of the activity provided that the cost of preventing unacceptable risk to the environment are in fact considered a cost of doing business.

We are committed to create a system that will not in and of itself involve any presumption as to whether the activity will or will not take place. It would simply ban the activity until it could be demonstrated that the activity can take place in a sound fashion.

The basic judgment as Dr. Zumberge has mentioned, as to whether there may be a proposal for an activity would be an economic one. If proposed, the question of whether it could then be accomplished in an environmentally sound fashion would be a subject for the decisionmakers to determine.

Senator GORTON. Another general question and, Dr. Zumberge, perhaps I will give you first shot at it.

In your view, is the U.S. program of scientific research tailored to meet our interests in Antarctica, and how might the nature and extent of that research be changed better to reflect those interests?

Dr. ZUMBERGE. The U.S. research program in Antarctica, beginning with the IGY, has been fairly eclectic across the board, trying to cover a number of disciplines.

If I were going to give a single piece of advice to the Division of Polar Programs in the National Science Foundation, I would suggest that we have now passed the stage of having to cover all scientific disciplines in Antarctica, that we should be more targeted in our approach, that we probably ought to pick out one or two large projects for a 5- to 10-year funding period, and this is something that has been spelled out in the recent recommendations of the Polar Research Board at the National Academy.

Of course, any science that is done in the Antarctica, whether it is in the big project category or the whole breadth of smaller projects distributed across a number of disciplines is dependent upon the quality of the individuals, and I think it is terribly important that the U.S. presence in Antarctica with respect to scientific programs be characterized by the best science and the best scientists.

That is always going to deliver what we want. But we do need some more guidance on the nature of the programs and the research should satisfy U.S. interests down there. And we have played quite a role in the whole minerals question, assessing it, evaluating it. Whenever it has come up in an international discussion, SCAR has been the forum in which this interest has been exploited, and U.S. scientists have always been very active in those areas.

So in the sense that the United States does not want to foreclose any of its potential interests there, certainly in that respect our science has supported the interests. The same is true of the living resources in the Marine Environment. U.S. scientists have been very active in the BIOMASS Program, giving it great stimulus and adding much to the successful completion of these two expeditions, beginning with FIBEX.

So I think the answer overall is yes, with some reservations that we want to be careful that we don't fall into a routine distribution of Federal dollars just to support a little bit of science in all of these areas but get some target areas that will pay off over the long haul.

Senator GORTON. Anyone else like to comment on that? Mr. Brown, we have succeeded in getting everyone to stay.

Dr. BROWN. Very good.

I do think that the emergence of oil and krill resource issues in the Antarctic pose a challenge to the U.S. scientific commitment in the area. That is because the National Science Foundation has traditionally, and I believe appropriately, operated and funded research on the basis of peer review and funded what in their view, through that, is the best basic research they think is being proposed.

That kind of research won't necessarily address adequately the environmental problems that can arise in oil development or in fisheries harvest. Some other agency probably, in my view, needs to commit more funds and establish programs to address Antarctic resource development issues.

I think NOAA should be that agency. Certainly, in the case of CCAMLR, and perhaps in the case of oil as well, although there is some more competition in agencies for jurisdiction there.

I don't mean to be particularly critical of NOAA in not having a formal Antarctic research program in a well-developed sense because money is pretty hard to get your hands on right now. I do think this past year, as far as I can tell, NOAA, for example, has reprogrammed more money than they did in past years to address the CCAMLR treaty. But it seems to me that Congress does have the real potential role in directing an agency like NOAA to establish an Antarctic research program with some money and with a legislative mandate on krill fishery in CCAMLR, as well as oil.

If we don't do that, we run into the problem of having no genuine basis for influence, at least certainly under CCAMLR, because there are two ways to influence what is going on in international fisheries. I think it is either to be a participant in a fishery or to be really doing some substantial research in the area. Right now we do neither.

Senator GORTON. Dr. Byrne, why don't you tell us what your agency thinks about this.

Dr. BYRNE. My agency has been mentioned, but I was prepared to comment before the mention of NOAA. I think Dr. Zumberge makes several good points. When he expressed some reservation about the adequacy of the science that we are doing down there, I thought perhaps he would go in a different direction, which is a reservation that I have.

He commented on the role that the broad spectrum has played in the past and what our future should be in terms of the kinds of research that we do down there. I have a reservation in that frequently our research activities are following the action rather than leading the action, and by this, I think the NOAA comment is pertinent.

Our activity in the marine resource area has been one which has been responsive to the development of diplomatic activity in the Antarctic rather than to the actual scientific needs that have occurred down there, and the comment here, of course, is the role that BIOMASS has played in sort of leading the action in taking us into that area.

In terms of NOAA's budget, what I would call high latitude research, we put roughly six times as much into the Arctic than we do into the Antarctic, and I think this is appropriate inasmuch as the needs that we perceive for service in the Arctic are much higher than they are in the Antarctic. Nevertheless, the Antarctic does provide a rather unique environment in terms of the unspoiled, undeveloped aspect of it which enables us to approach matters from an ecosystems point of view.

So I think that we will continue to see additional resources put into this area, particularly with respect to the marine ecosystem.

The comment that I would like to focus on, however, is one which Dr. Zumberge made with respect to the quality of our scientific activities as being a function of the people who are involved. And one problem area that I foresee is that unless we have a long term plan, a long term goal in this area, that we may find ourselves short of the kinds of people who are qualified and who have a desire to work in this type of environment.

It seems to me that over the long haul, working in the Antarctic will require Federal support. And so in looking at the program that both the National Science Foundation and the other agencies would pursue in the future, I think a very sharp eye should be focused on the development of qualified scientific personnel who have developed some sort of experience and some sort of desire to work in that environment.

Senator GORTON. Dr. Hofman.

Dr. HOFMAN. Several additional points, Mr. Chairman. I mentioned in my testimony, and I think Dr. Zumberge did in his, that the National Academy of Science has done two studies which identify U.S. research interests in the Antarctic and where the emphasis should be placed in the future.

A number of other speakers also have noted that the living and nonliving resource issues facing us right now have identified new needs, and there is in fact, as Dr. Zumberge noted, a need for targeted research.

In this context, I note that some scientists feel that some of the studies that are needed are not science. The types of things I am talking about are the descriptive baseline studies and the long term monitoring programs needed to assess and detect the possible impacts of krill fishing or other types of fishing, and the possible effects of mineral resource activities.

I think that there is in fact a gap, not only in the U.S. Antarctic research program, but probably in Antarctic research programs in general.

Finally, I think that Dr. Byrne raised a very good point when he noted that there is a need for a long-term-program plan. Such a plan is necessary to identify what is needed and to determine how best to go about implementing it.

Dr. **Brown**. Just one brief comment to note something that was brought up earlier that would tie all this together. That is the legislation that is pending to implement CCAMLR, at least as far as the living resource side of it goes.

That legislation would set up a directed research program under NOAA's jurisdiction which all the environmental groups I think have fully supported and would very much like to see pass this Congress if it is at all possible, before it recesses. It would have all those characteristics that have been described here.

I think in the long term it would be focused on the management needs of the convention and so forth and would put the United States in a much better position to play a leading role in the implementation of CCAMLR.

Senator **Gorton**. Thank you all very much for your help here today.

You have been very, very helpful on what is the beginning of a series of hearings, in an attempt to formulate a congressional approach to the subject of Antarctica.

The meeting is adjourned.

[Whereupon, at 11:41 o'clock a.m., the committee recessed, subject to the call of the Chair.]

ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

Statement of Adm. James S. Gracey, Commandant, U.S. Coast Guard, Department of Transportation

ANTARCTIC ICE OPERATION

The U.S. icebreaker fleet has been instrumental in building and supporting the nation's presence in both polar regions, including support of scientific missions in Antarctica. The major missions to which icebreakers have been and are assigned in the Antarctic are:

Resupply of NSF research stations, including McMurdo ice channel break-in and ice escort for other support vessels; support (as either the primary platform or ice escort) for the U.S. Antarctic Research Program; and support platform for U.S. inspection of research stations of other nations.

The United States has political, strategic, environmental, scientific and resource interests in Antarctica. The paramount interest for the U.S. is to maintain Antarctica as an area of peace and cooperation. Environmental and scientific interests are dictated by the desire to preserve the unique ecological systems of the continent and by the value of Antarctica as a laboratory for the study of natural processes. Resource interests are currently hypothetical, but it is important to continue to ensure non-discriminatory access for the United States.

The vehicle through which the U.S. has pursued these interests is the Antarctic Treaty of 1959. The success of the Antarctic Treaty system to date in maintaining peace and cooperation has been largely due to the leadership of the United States. The basis of this leadership role has been the nature and extent of the U.S. operations in Antarctica and the commitment of the U.S. to the practical realization of the principles and purposes of the Treaty system. The U.S. program, managed by the National Science Foundation, includes the conduct of scientific activities in major disciplines, year-round occupation of the South Pole and two coastal stations, and availability of related logistics support.

A key element of the U.S. presence in Antarctica has been and will continue to be the availability of icebreaker support to open supply channels to coastal stations and perform a variety of other functions during the austral summer season (November through early April).

Growing Third World interest in Antarctica has been manifested by United Nations General Assembly debate and a resolution directing the Secretary General to prepare a "comprehensive, factual and objective" study on Antarctica. Malaysia, which took the lead in raising the issue of Antarctica, has made clear that the goal is to open up the "secret club" of the Antarctic Treaty and ultimately to declare the resources of Antarctica to be the "common heritage of mankind". The Antarctic Treaty Consultative Parties, including the United States, have defended the Antarctic Treaty system and opposed the "common heritage" concept, while emphasizing that the Treaty System is an open one. The Consultative Parties are also engaged in negotiating a new agreement to cover possible future mineral resource activities in Antarctica, which if unregulated could upset the balance between territorial claimants and non-claimants established by the Antarctic Treaty.

In view of these new challenges, a firm United States presence in Antarctica is even more important. President Reagan in 1982 reaffirmed the policy that "the United States Antarctic Program shall be maintained at a level providing for an active and influential presence in Antarctica designed to support the range of U.S. Antarctic interests." That presence will continue to include icebreaker support as a vital element.

AUTHORITY

Coast Guard authority to conduct polar ice breaking is contained in several sources—statutory law, administrative regulations, interagency agreements and international treaties. The basic authority for ice breaking is 14 USC 2:

"The Coast Guard shall develop, maintain and operate, with due regard to the requirements of national defense, aids to navigation, ice-breaking facilities, and rescue operations for the promotion of safety on and over the high seas and waters subject to the jurisdiction of the United States . . ."

The major source granting the Coast Guard responsibility for the U.S. icebreaker fleet is the "Revised Memorandum of Agreement between the Department of the Navy and the Department of the Treasury on the Operation of Icebreakers", dated 22 July 1965. This agreement provides for the transfer of all U.S. icebreakers to the Coast Guard.

NSF has been assigned the single-agency responsibility to fund and manage the U.S. national program in Antarctica, including research and logistic support. Basic research in Antarctica is entirely coordinated and, with minor exceptions, funded by NSF.

The 1965 Navy-Treasury MOA was executed to permit consolidation of the icebreaker fleet under one agency. That rationale was reinforced by the 1982 Roles and Missions Study which states polar icebreakers should be centrally managed by one agency and that the Coast Guard is the appropriate one due to the multi-mission nature of polar ice operations.

Subsequently, as the agency responsible for operating, crewing, and maintaining the nation's icebreaker fleet, the Coast Guard is tasked by the MOA with "(assigning) icebreakers to Navy operational control for seasonal deployments to the Arctic and Antarctic in support of the national interests."

The MOA further states ". . . (participating) to the extent practical in polar scientific programs sponsored by the Navy, the Coast Guard, the National Science Foundation and other federal and private agencies having approved scientific missions requiring icebreaker services", and ". . . providing logistics support of (U.S.) Antarctic bases and the inspection provisions of the Antarctic Treaty."

The agreement also calls on the Coast Guard "to replace icebreakers in its inventory with ships of appropriate size and power to meet the very heavy ice conditions in the Antarctic and the potential military needs in the Arctic, to fulfill the reasonable demands of commerce and to carry out the U.S. science and research programs in polar regions."

"Complete implementation of this agreement by the Coast Guard will be dependent upon the appropriation of the necessary funds."

A recent presidential document emphasized the growing importance of the Antarctic regions to the United States. The ice-breaking mission in this polar region is in pursuit of the objectives of the Presidential Memorandum of February 5, 1982 on United States Antarctic Policy and Programs.

The Presidential Memorandum on Antarctic Policy and Programs was issued in response to the Antarctic Policy Group's 1981 study of United States interests in Antarctica and related policy and program considerations. The memo states that the "Antarctic Program shall be maintained at a level providing an active and influential presence in Antarctica designed to support the range of U.S. Antarctic interests . . . this presence shall include the conduct of scientific activities in major disciplines; year-round occupation of the South Pole and two coastal stations; and availability of related necessary logistics support". The memo also tasks the Coast Guard (DOT) with logistical support of the antarctic program. The Coast Guard maintains United States' sole polar surface maritime capability necessary to project into the polar regions whenever and wherever we want in support of national interest.

Two other administrative regulations, Office of Management and Budget (OMB) Circular A-51 dated August 4, 1971, and National Security Decision Memorandum (NSDM) 318 dated February 1976 call on the Coast Guard to "make all reasonable efforts to assure the availability of icebreaker services as requested by the NSF for the Antarctic program" and mandate "the DOD and DOT . . . to maintain the capability" to support the NSF program. They also direct DOT to "continue to provide, on a reimbursable basis, the logistics support requested by the NSF." This is provided for under an MOA between NSF and USCG dated October 26, 1982.

The advantages of Coast Guard operation of the icebreaker fleet are addressed in the 1982 Coast Guard Roles and Missions Study.[1] Two conclusions of that study are that marine science activities are an essential part of the U.S. Antarctic program that cannot be implemented without icebreaker support and that polar ice breaking in support of federal activities in both the Arctic and Antarctic is a valid federal mission and serves the national interest.

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[1] These are, briefly: USCG is a military organization that would transfer with the icebreaker fleet to the Navy during wartime; USCG is the federal maritime law enforcement agency; USCG SAR responsibility extends to ice-covered waters; USCG is responsible for northern aids to navigation; USCG is tasked with overall facilitation of marine transportation; USCG has a vast amount of agency experience in ice-covered waters and maintains a cadre of specialized ice-qualified officers.

ICEBREAKER FLEET

The nation's polar icebreaker fleet consists of five ships: two POLAR Class—POLAR SEA and POLAR STAR; GLACIER; and two WIND Class—NORTHWIND and WESTWIND. These ships were commissioned in 1978, 1976, 1955, 1945, and 1944 respectively. The United States polar icebreaker fleet is, by a wide margin, the world's oldest, with a median age of 30 years. In contrast, the Soviet and Canadian fleets each have a median age of ten years. The polar Icebreaker Requirements Study (completed July 1984), which examined polar icebreaker needs from all federal agencies through the year 2000, revealed that in terms of capability, the POLAR Class compares very favorably with the world's fleet. GLACIER, NORTHWIND and WESTWIND, however, fall below present day icebreaker standards, primarily because of the outmoded systems and deteriorating material condition.

Probably more than any other class of Coast Guard cutter, icebreakers are multimission vessels. They have deployed in every ocean, including the Soviet Arctic, and often have been the first vessel ever to reach an area. They have performed the missions for which they were designed (military action, logistics support, ice escort, and research) and those unforeseen at the time of design.

Additionally, they have been tasked with most traditional Coast Guard missions both inside and outside the polar regions: search and rescue, enforcement of laws and treaties, Navy fleet exercises and wartime patrols, aids to navigation, and environmental response. Simply put, "They do much more than just break ice."

The Coast Guard first deployed to the Antarctic on a continuing basis when preparations for the International Geophysical Year (IGY) increased yearly requirements for the icebreaker fleet in Antarctica. In the austral summer 1954-55, SOUTHWIND (then named USS ATKA) was sent to locate a site for future IGY stations.

To satisfy the nation's increasing interest in Antarctica, a new icebreaker, GLACIER, was constructed by the Navy in 1955. GLACIER primarily served in the Antarctic, because she had ice-breaking capability, science facilities, and cargo capacity superior to the WIND Class.

The preliminary logistics operations of the 1955-56 season, termed Deep Freeze I, sent building materials, equipment and supplies for the upcoming work and established two stations. Deep Freeze II, 1956-57, was part of the largest multi-nation Antarctic expedition in history; the U.S. sent twelve ships and 3,000 people. GLACIER arrived in McMurdo Sound on 28 October 1956, the earliest arrival date there ever. Four more stations were established, including South Pole. Operation DEEP FREEZE, which provides logistic and icebreaker support to Antarctica, has become an annual event since IGY. In 1968, GLACIER made the first extensive U.S. survey of the western Weddell Sea.

In 1982-83, POLAR STAR recorded the first complete circumnavigation by a U.S. surface vessel of the Antarctic continent below 60° S latitude. At the time POLAR STAR was conducting marine research and supporting U.S. inspections of foreign research stations, which verified their compliance with the Antarctic Treaty. The POLAR Class is superior to either the WINDS or GLACIER in icebreaking capability.

HISTORICAL USAGE OF ICEBREAKERS

The fleet has during the past 17 years been used in four ways during polar operations: escort; logistics support; platform of observation; and sensor platform.

Escort

Escort duties have traditionally included escort of resupply, drilling, cable-laying, and research vessels through ice-covered waters. The icebreaker creates an open water path through which these ships can navigate. For research, drilling (coring), and cable-laying, these duties have also required the icebreaker to maintain an ice-free area around the vessel, so that operations would not be impaired by ice. Escort duties have also included creating and maintaining an open water channel in fast ice, to facilitate navigation.

Often times excort duties require the icebreaker to be on standby; the icebreaker is dispatched to assist vessel traffic as needed. During these standby periods, the icebreaker may be directed to perform bathymetric surveys, and survey underwater structures.

McMurdo Sound break-in/resupply is considered escort.

Logistics support

Logistics support duties have made extensive use of shipboard capabilities. In a majority of these operations, the icebreaker serves as a base for other operations providing manpower, fuel, food, shelter, communications and transportation for field parties and detached boats and aircraft. It also requires icebreakers to carry cargo above and below decks, berth several passengers, and provide medical and repair facilities as needed.

These past operations are considered logistics support:

Antarctic Treaty inspection; Campbell Island logistics; Casey Station resupply; Hallett Station resupply; McMurdo Sound local operations; and Palmer Station resupply.

Platform of observation

As a platform of observation, an icebreaker is used to deploy and retrieve equipment and make required observations. Because many research programs require observations in ice-covered waters, the utilization of an icebreaker normally insures that the researchers can reach the operating area and return safely. Most of the work is performed from aboard ship; however several research projects require coordinated operations utilizing the ship's boats and aircraft. Like logistics support duties, the icebreaker may be required to carry cargo above and below decks, berth several passengers, and provide medical and repair facilities.

Icebreakers have been used as observation platforms for the following purposes:

Oceanography and marine sciences—acoustics; biology; chemistry; geology; meteorology; and physics.

Study of polar features/processes—aurora; bathymetry; glaciers; icebergs; marginal ice zone; natural resources; pollution effects; and sea ice.

Sensor platform

As a sensor platform, an icebreaker is instrumented to measure engineering parameters. Various shipboard systems may need to be calibrated in advance of the deployment. The icebreaker may additionally be required to provide logistics support or serve as a platform of observation.

Icebreakers have been used as sensor platforms for the following purposes:

Acoustic systems calibration; acoustic systems tests; ambient noise measurements; full-power ice breaking tests; full-scale ice loading tests; and full-scale ice resistance tests.

Other

At times, the fleet has received special defense-related tasking.

National Science Foundation

The mission of the National Science Foundation is to support research in the sciences and engineering.

The research that is supported in the polar regions focuses primarily on developing a comprehensive understanding of the nature and the functioning of components of natural environmental systems. Thus, the projects regularly supported are in such disciplines as glaciology, meteorology, upper atmosphere physics, geology and geophysics, oceanography and polar marine biology. The Antarctic Living Marine Resources program, which assesses quality, quantity, and the environment of krill and fish stocks in the marine life cycle of the antarctic region, is one that requires icebreaker services.

As custodian of the national interest in the Antarctic, NSF's goal is to satisfy the policy to maintain an active and influential presence in the area. This presence is achieved in part by the maintenance of year-round stations at the South Pole and at two coastal sites, while the principal expression of the national interest is scientific research. Effective presence, indeed the conduct of virtually any meaningful activity, in Antarctic, is a function of the availability of large quantities of bulk fuel. McMurdo Station at 77°-51'S, 166°-40'E is not only the southernmost coastal station, it is among the most accessible to ship transport and, therefore, a major bulk fuel delivery site. However, the final approach of some 15 to 30 miles to the station by ship requires icebreaker penetration of annual shorefast sea ice.

The fundamental icebreaker requirement is, therefore, the annual channel break-in at McMurdo and the associated escort of the tanker and supply ships. Although the supply ships are ice-strengthened, icebreakers are required to cut and clear a channel through heavy concentrations of fast pack ice.

In 1991 the Antarctic Treaty may be up for review, if it is called for by one or more of the consultative parties. The political structure of the Antarctic may be significantly changed due to initiatives put forward by third world countries.

Exploitation of hydrocarbon resources in the Antarctic is unlikely before the year 2000. The technology required is beyond the highest level planned for the offshore Arctic, and the commerciality of such an exploitation (if it were possible) is even more problematic. Specific polar icebreaker requirements for the traditional Coast Guard missions of Commercial Vessel Safety (for offshore facilitites) and Marine Environment Response in the Antarctic are unlikely.

The Convention on Conservation of Antarctic Living Marine Resources may require boarding and inspection of U.S. vessels or facilities engaged in harvesting krill or other Antarctic marine life. At present support of the Convention has been limited to researh into the marine ecosystem of the Antarctic, but provisions exist within the Convention for regulation of the quantity and species taken including boarding and inspection.

In summary, future traditional mission requirements for polar icebreakers in the Antarctic will depend on treaty developments and U.S. policy in response to those developments.

To achieve the goals established by this administration, the United States must look to the issues of today and the happenings of the past and realize that a polar icebreaker fleet is an important element by which policy-makers can protect essential security interests, promote scientific research, and provide an active and influential presence in the Antarctic.

STATEMENT OF THE OCEANIC SOCIETY

The Oceanic Society is a 60,000 member non-profit national environmental organization dedicated to the protection, conservation and wise use of marine and coastal resources. The Society's involvement in marine research, education and policy development is based on the conviction that careful and prudent use of marine resources is essential if we hope to maintain a habitable planet.

The Antarctic Treaty System provides a solid foundation for establishment of a legal and management regime that is responsive to both conservation and development goals. Development and implementation of this regime offers a unique opportunity to pursue necessary scientific research that will provide an informed basis for decisions about the management of Antarctica and its resources.

The Oceanic Society believes that conservation and preservation of Antarctic and Southern Ocean ecosystems must take priority over exploitation of resources. We endorse the view adopted by the International Union for the Conservation of Nature and Natural Resources' (IUCN) 1981 Resolution on Antarctic urging Antarctic Treaty Consultative Parties (ATCP's) to refrain from establishing measures for exploitation of minerals until "full consideration has been given to protecting the Antarctica environment completely from minerals activities . . ."

Before minerals exploitation is permitted, the Oceanic Society believes that there must be a careful and thorough assessment of potential environmental impacts from such exploitation, actual market needs, and the adequacy of technology to safely conduct exploitation operations in the hostile Antarctic environment. Towards this end, scientific research needs to be accelerated to provide a better understanding of the ecosystem at risk and the degree and extent of that risk. Minerals exploitation should not be permitted unless a broadly accepted scientific basis exists for concluding that such activities can be conducted safely, without posing risks to the valued ecosystems of the region.

The "ecosystem as a whole" concept contained in the Convention on the Conservation of Antarctic Marine Living Resources is an important mechanism for conservation management of Antarctic and Southern Ocean ecosystems. The value of this concept is readily apparent when we consider the management of krill—the critical link in the Antarctic food chain. Sound management of the krill fishery requires further scientific studies as a basis for setting quotas for krill. Until such information is available, a freeze on fishing for krill at present levels, with fishing prohibitions in some areas, is the rational solution for the near term. At the same time, understanding krill is only one step in the development of the "ecosystem as a whole" concept in Antarctica. Relationships among all living resources in the area and their habitats must be fully explored before effective implementation of this concept can occur. Such efforts will contribute immensely to conservation goals for

Antarctica, and can serve as a valuable model for application of this concept to other regions of the world.

The decisions to be made regarding Antarctica and its surrounding environments are crucial ones—for the ATCPs *and* for the rest of the global community. Effective opportunities for public participation need to be incorporated into the decision making process. Open forum deliberations will enhance the prospect that all reasonable options and alternatives are being considered. All interested parties, including non-governmental organizations, should have access to Antarctic Treaty meetings and to other forums where the issues are debated or decisions are in process. The September 24, 1984 hearing before the Subcommittee on Science, Technology and Space of the Senate Commerce Committee is one example of how diverse views can contribute to this effort; the debate before the 38th Session of the U.N. General Assembly last year, the U.N. Secretariat's current study and the expected further consideration of Antarctica matters at the 39th Session of the General Assembly later this fall is another. By broadening the base of effective participation, including timely access to pertinent information, decision makers will be far better equipped to identify and achieve objectives and solutions for Antarctica that are widely acceptable.

The opportunity still exists in Antarctica and the Southern Ocean to avoid environmental harm or destruction and its accompanying economic and intrinsic costs. We are all too aware of the cost of development unchecked by long term environmental considerations. The Mediterranean and the Baltic are two unfortunate examples from which we must learn. There is time to proceed with caution in the Antarctic region in order to fully understand the ecosystems as they exist and to assess the effects of exploitation on living and non-living resources. We can bring to bear the necessary skills and resources to weigh the benefits of conservation against the risks of exploitation, based on sound science. A major cooperative effort will be needed to accomplish these tasks. If we are truly committed to the principles upon which the Antarctic Treaty rests, the opportunity is ours to ensure that the Antarctic region and its resources are not jeopardized.

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